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Boards as Contractors

TRADING ACCOUNTS EXAMINED

IN the "Notes on Consolidated Accounts" which appear in the first report of the British Electricity Authority there is this comment upon the contracting and fittings sales activities of the Electricity Boards:—

> "Such Area Boards as intended to develop this branch of their business had not had time by the end of the financial year [31st March, 1949] to do so to the full extent. As might be expected in these circumstances comparisons between Boards reveal substantial differences both in turnover and in net profits."

Extent of Business

Thus the figures given for this side of the Boards' operations are really a reflection of the state of affairs existing before nationalization, but for the first time they enable an idea to be gained of the size and extent of this business.

One way of gauging how far the Boards have gone into the business is to compare the revenue from this source with that derived from the sale of electricity. Upon this basis the list is headed by the Eastern Board whose contracting and retailing income (not surplus) was £2,922,990, representing 16.2 per cent of that received from the sale of electricity. There followed the South Western Board, £952,437 (14.1 per cent). It is presumably fortuitous that these were the two Boards to incur an overall deficit. They earned surpluses on their installation departments; the losses must have been on electricity sales. Both Areas are largely rural.

Figures for the other Boards were: Southern, £1,822,571 (12.8 per cent); South Eastern, £1,393,507 (11.2 per cent); East Midlands, £1,131,289 (8.1 per cent); North Western, £1,604,550 (7.9 per cent); Midlands, £1,407,094 (7.8 per cent); Merseyside and North Wales, £787,199 (7.0 per cent); North Eastern, £716,126 (6.6 per cent); Yorkshire, £1,112,234 (6.6 per cent); South Wales, £555,559 (6.4 per cent); London, £1,609,946 (5.9 per cent); South East Scotland, £208,616 (5.1 per cent). Least activity was shown by the South West Scotland Board, whose revenue from this source (£289,657) was only 3.0 per cent of the income from electricity. The total for all Boards was £16,513,775 (8.7 per cent).

Variation in Indirect Costs

Although a standard form of accounts has been adopted by the Boards there are considerable differences in practice. The direct costs shown comprise materials, wages, transport, and adjustment of value of work in progress. Indirect costs are: Sundry purchases, salaries and wages, transport, bad debts and proportion of administration and general expenses. The ratio of direct costs to total sales ranges from 79.4 to 86.0 per cent, with an overall figure for the fourteen Boards of 82.0 per cent.

The amounts which are debited for indirect costs are less uniform; the lowest is 2.7 per cent for South West Scotland and the highest 18.1 for South East Scotland;

the overall percentage is 12.0. This wide variation in indirect costs is reflected in the surpluses, which run from 0.8 per cent (Merseyside and North Wales) to 17.1 per cent (S.W. Scotland) and represent 6.0 per cent overall.

There seems to be no ruling in the matter of the allocation of "proportion of administration and general expenses." In the case of the Eastern Board this item was 12.0 per cent of the total costs (direct and indirect) and for Merseyside and North Wales 11.8 per cent; for South West Scotland it was only 0.5 per cent. The overall figure was 7.6 per cent.

These statistics will interest, if they do not instruct, electrical contractors who are anxious to know something of the principles on which the Boards run their installation and retail departments.

TESTS ON 132 kV SYSTEM

The fault-throwing tests on the 132 kV grid system described at the I.E.E. last week, to which reference is made on another page, are of more than usual interest. They not only ultimately yielded much of the information sought about the particular form of protection that was being investigated, but additionally drew attention to certain effects which, though incidental to the main purpose of the tests, will be very useful to power system operators. A considerable amount of courage was needed to undertake tests of this kind, the like of which does not seem to have been attempted before at home or elsewhere. The records of the experiment would be incomplete without an expression of appreciation to the C.E.B.-B.E.A. engineers who pursued these investigations.

PURCHASE TAX

Mr. W. A. Gazard, writes in the February *Electrical Contractor* on "recent comments on the wisdom, honesty and whatnot of displaying purchase tax separately when pricing goods for sale." It seems probable that he is referring to our leaderette of 25th November last. He says that the comments "imply a certain aloofness (a kinder term than ignorance) with regard to retailing, as all the customer is interested in is the amount he is called upon to pay." This (about the customer) is true, no doubt, but our point was that in advertisements likely to be seen by overseas buyers (who do not have to pay the tax) the use of an inclusive price or a price plus tax might lead to a loss of orders. It was for this reason that we advocated that in journals with circulations extending beyond these islands (including the *Electrical Review*) it should be made clear that the purchase tax was payable only by the home customer. Mr. Gazard thinks that the tax is here to stay, but let us hope that this problem will soon be solved by the freeing of electrical appliances.

EGYPTIAN CONTRACT DISPUTE

Some feeling has been aroused by the rejection of two British companies' tenders for equipment by the Seattle (Washington) municipal authorities. The American electrical manufacturers do not appear to have been behind the rejection, and it is clear that they have their troubles, too. Recently the Westinghouse Electric International Co. was awarded a contract for the construction of a power station in Cairo. Later the contract was cancelled and the work was placed with the French Alsthom concern; presumably it was the necessity for paying the American company in dollars which caused the Egyptians to change their minds. The Westinghouse Co. is to contest the decision in the Egyptian courts, although the Government contends that these courts have no jurisdiction in the matter.

THIS YEAR'S B.I.F.

Stress is being laid upon British manufacturers' ability to promise earlier and firmer deliveries at this year's British Industries Fair (8th to 19th May). It is also expected that the prices of many products will be more favourable to overseas buyers, particularly those from the North American countries, as a result of the altered dollar-sterling rates. Last year there were 784 buyers from the United States and 424 from Canada, and the organizers (the Board of Trade and the Birmingham Chamber of Commerce) anticipate a 50 per cent increase this year. In the same Press statement it is said that at Birmingham there will be 26 civil engineering exhibitors occupying 66,000 sq ft. We think that special mention should have also been made of the Electrical Section of 60,000 sq ft with well over 200 exhibitors.

Novel Stage Equipment

Mobile Band-Car and Component Lifts at the Empire, Leicester Square

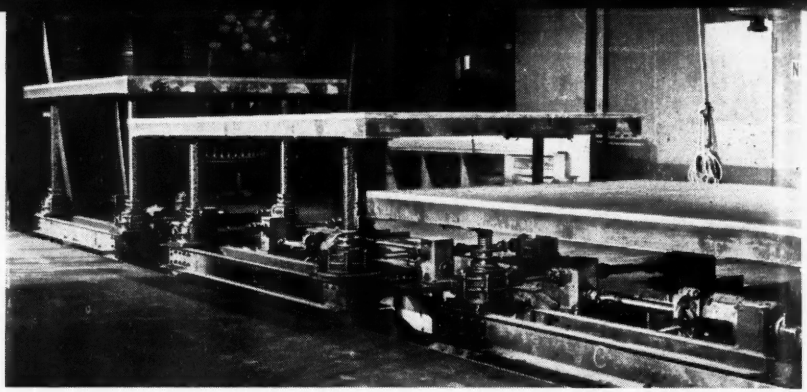
THE return of the Empire, Leicester Square, London, to variety entertainment for the first time since its rebuilding twenty-one years ago has provided an opportunity for the installation of a number of novel electrical devices, enabling most spectacular stage effects to be presented.

The most striking piece of apparatus is a "band-car" or mobile orchestra unit on which thirty-two instrumentalists travel forward a distance of 35ft from back-stage on to the raised orchestra lift which is then lowered 6ft below stage level, the reverse procedure taking place at the end of the show. The band-car, which measures 30ft by 12ft 6in by 1ft 4in high and weighs 5 tons when fully loaded, is entirely self-contained, being driven from a 24 V "Nife" alkaline battery which, complete with the driving and remote control mechanism, is accommodated in the shallow platform top of the car.

In view of the fact that the car is only 16in high from the stage level, two small motors have been employed instead of one larger one. Mounted one each side of the car, these are each of 1½ h.p., 24 V, compound wound, and have been specially made for the purpose by Lancashire Dynamo & Crypto, Ltd. A series-parallel starter and electro-mechanical brakes have been supplied by Dewhurst & Partner, Ltd. The speed of the car is 48ft/min and the control of the apparatus is in the hands of the conductor who is provided with "Forward," "Reverse" and "Stop" push-buttons.

The drive is through a step of vee-belt reduction and two steps of chain reduction to a long shaft running practically the whole length of the band-car. No guiding mechanism is provided, the use of four pairs of special wide-faced rubber rollers ensuring an almost negligible deviation from its path. So slight is the shift that with a return journey four

The illustration above shows a mobile "band-car" in position on the raised orchestra lift



Down stage compound lift showing how the three platforms can be arranged at different levels

times daily adjustment is necessary only about once a week. Combined bumpers and limit switches arranged in series, three in front and three at the back, stop the platform on its arrival at the end of its journey, while, to guard against any danger arising from any of the stage or orchestra lifts not being at their proper levels, small rollers fitted to the bottom stop the car within the space of 3in should they encounter any irregularity in the floor.

The battery, which is of 70 Ah capacity, is arranged in four groups of six cells and besides furnishing the motive power for the band-car, also supplies thirty-two 6 V 6 W lamps for the use of the musicians during the forty-five minute shows. Charging is carried out at night by means of a Crypton unit supplying 8 A.

The orchestra lift on which the car is lowered during the show was a part of the original installation carried out in 1928 by Knight & Co. It is the successors of this company, Knight Theatre Equipment, Ltd., who were responsible for the band-car and also for a new set of stage lifts. Fundamentally there are two in number, each 38ft by 7ft running close to one another, but the down-stage unit has its top platform further sub-divided into three separately controlled lifts.

Underneath the stage lift showing the screws together with their driving mechanism

The up-stage lift, which can travel from stage level to a height of 6ft 6in above stage, is raised on six screws by a pair of 7½ h.p., 1,400 r.p.m., slipring motors in tandem through a double-ended drive. The rotor resistance is arranged in two steps, some of it being left in circuit. Both the stators and rotors are wired in parallel. Each motor is equipped with a 6in Dewhurst electro-magnetic brake. This lift has a speed of 12ft/min, giving a moving time of about half a minute for its full travel. It has a static capacity of 100 lb/sq ft and power to lift a load of 50 lb/sq ft.

The down-stage lift is a much more complex arrangement in which the main platform of the full size, 38ft by 7ft, is raised and lowered on six screws again driven by a pair of motors in tandem, this time, however, of 10 h.p. and with 8in electromagnet brakes. On this basic platform which has a travel of 8ft 8in, are three sub-lifts complete with 5 h.p. motors, distributor gear boxes and screw jack boxes, there being four jack boxes to each lift. These sub-platforms have a travel of 4ft 4in so that a total travel of the actual floors of 13ft is obtainable.

By this means this area of the stage

can be dropped into the basement where it can be loaded with scenery or artistes and can be raised to a total height of 6ft 6in above stage. The sub-platforms, however, can be relatively stopped at any level between their maximum travel and the main platform only moved to retain this stepped form during travel. A number of combinations of relative height are thus obtainable and also some interesting effects such as doubling apparent speed by driving all motors together, or creating a temporary static period of one or more of the sub-platforms by running motors in opposing directions.

All these lifts are controlled, via a single contactor panel (Dewhurst) in the basement, from two sets of push-button control consoles, one in the prompt corner and the other at the end of the lift where a clear view of movement is obtained. Each lift is provided with automatic up and down levels and an intermediate mid-floor limit switch, so that a pre-set height anywhere between extremes can also be obtained.

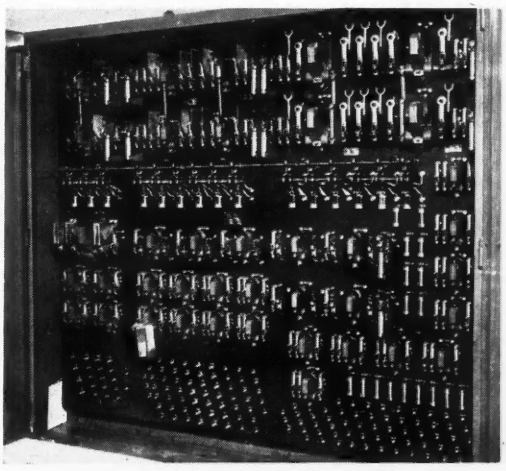
In addition there are master relays by means of which a single push-button can send all the sub-lifts up or down to their pre-set mid floor. Another single button can send all lifts to their fullest heights and finally a single button can regain the stage level, no matter whether some lifts are up and some down or however they may previously have been set. In addition a master control fitted with a Yale lock is situated in the stage manager's console. The push-button consoles also incorporate complete level and other indicating signal lamps operating from a 12 V transformer. The lift driving motors themselves work from a new 400 V, 3-phase, 50-cycle mains supply which has just been connected.

Knight Theatre Equipment, Ltd., were also responsible for rearranging the existing mechanical stage equipment and it is interesting to note that, with the aid of Gretton-Ward, Ltd., acting as sub-contractors for the electrical wiring, the whole of the new equipment was carried out in only nine weeks from the granting of the licence and without closing the theatre.

To provide facilities for the many new lighting effects required Blackburn Starling & Co., Ltd., who carried out the original illumination scheme in 1938, have considerably modified and extended both the stage and auditorium installations. By transferring the control of auditorium lighting to a new motor-controlled dimmer board and control gear in the contactor room in the basement, the whole of the original stage switchboard can now be utilized for the stage lighting. Completely redesigned and rewired, this four-colour pre-set switchboard has three settings plus independent operation. Two of the settings can be remote controlled if required.

Four new sets of area floods, each comprising sixteen 1,000 W lamps, have been added to the stage equipment and all four battens, each of sixty-four 300 W lamps, have been removed and reconditioned. To reduce the amount of wiring necessary for both borders and area floods a new fly rail has been provided approximately 30ft above the stage level, all connection boxes being fitted at this level. For side stage lighting new booms have been fitted, carrying fifty-six 1,000 W spotlights as well as 104 100 W units for

"Dupar" contactor panel for controlling the stage lifts



upright X-ray borders and ground row.

With the addition of four new sections of housing in the balcony facia, the number of 1,000 W spotlights has been increased from twenty-seven to forty-three. Each lamp is connected to a separate dimmer on the stage board. Twelve 1,000 W spot lanterns have been fitted in the main ceiling to cover the orchestra, and additional spotlights have been installed for the organist, band leader and solo artiste. To reduce the auditorium decorative load half the lamps in the inner and outer dome have been disconnected and cold cathode lighting substituted.

An additional Western Electric sound amplification system installed for the stage shows comprises ten microphone circuits, each equipped with its own line amplifier to raise the signal level before mixing. A special mixer position has been provided at the side of the balcony. Seven two-way loudspeakers above the proscenium and on each side of the ante-proscenium area are supplemented by a specially designed flat multi-cellular horn run at low level and situated under the soffit of the balcony. There are four fully automatic microphone lifts, remote controlled and concealed by trap doors when not in use.

Mr. Stanley Morgan, chief engineer of the "Empire," supervised the whole installation. We are grateful to him and also to Mr. A. Scott Knight, director of Knight Theatre Equipment, Ltd., and Mr. C. Adkins, of Blackburn Starling & Co., Ltd., for their help in preparing this article.

POWER SYSTEM FREQUENCY

A USEFUL addition to the information which is generally available in control rooms is a knowledge of the rate of change of the supply system frequency. Brief accounts have already been published of two instruments designed for this purpose, but on Tuesday of this week Mr. E. Bradshaw and Mr. M. Z. Tanyeloglu (both of the Manchester College of Technology) presented a paper before the Measurements Section of the I.E.E. which described an alternative arrangement for performing the same function.

This instrument is essentially a sensitive frequency-meter in which changes in frequency over successive fixed time periods are used to obtain values for the mean rate of change of frequency over these periods.

The supply voltage of which the frequency rate of change is to be observed is connected to a 3,000 r.p.m. synchronous motor driving a 2,000 c/s toothed-wheel variable-reluctance alternator with 40 teeth. This is fed into the frequency-meter section of the instrument, which consists of a frequency sensitive bridge network arranged to be continuously self-balancing by means of a servo-motor. The latter is controlled by the out-of-balance voltage from the bridge and itself controls the variable-impedance bridge elements necessary to maintain balance.

The rate-of-change-of-frequency display unit depends for its operation on the measurement of the angular rotation of the servo-motor shaft in successive equal intervals driven by the motor. This unit determines, and displays on indicating and recording meters every 30 sec, the mean rate of rotation of the servo-motor shaft and hence the rate of change of frequency, measured over 2-min periods.

The paper outlines the main design features of the unit and also gives details of its operation and performance. Experience suggests that it may not always be used continuously, but only when the system load is expected to vary rapidly. It is, therefore, of interest to note that, provided the power supply units are kept energized, the time taken to put the instrument in commission is about 2½ min.

H.F. Heating Course

A SPECIAL course of four lectures on "High Frequency Heating in Industry" will be given by Messrs. J. A. L. Wharton, R. E. Bazin, P. M. Paine and E. S. Wilson (members of the research and design staff of Redifon, Ltd.) at the Polytechnic, Regent Street, London, W.1, on Friday evenings commencing on 24th February. The fee for the course is 10s and enrolment forms can be obtained from the head of the Electrical Engineering Department of the Polytechnic.

Electrical Research

Summary of 1949 Activities of E.R.A.

THE twenty-ninth report of the British Electrical and Allied Industries Research Association, presented at the annual general business meeting to-day, covers the twelve months ended September, 1949. That was the first year since the revision of the Articles of Association, necessitated by the Electricity Act, 1947, whereby the British Electricity Authority and the Area Boards, as separate ordinary members, together with the North of Scotland Hydro-Electric Board, now nominate a certain number of representatives to the E.R.A. Council.

However, the general distribution of Council nominations as between supply and manufacture remains substantially unchanged. The number has been slightly increased to allow for Transport Commission representation, the co-opting of personalities and an additional appointment by the D.S.I.R. which has been used to enable the Ministry of Fuel and Power to be represented.

Association's Finances

The B.E.A. and Area Boards are making a block contribution of larger size than would have been paid by the authorized undertakings they have replaced. Subject to annual review, it will be increased by an agreed amount this year and next. Manufacturers contributing on an assessment basis are making comparable increases. Large manufacturers paying through the B.E.A.M.A. are increasing their contributions by 50 per cent and other similar negotiations are proceeding.

In addition the Ministry of Agriculture is making a special contribution and there will be some contracts at full cost with the Admiralty and others. Apart from these arrangements, the special financing of certain costly development projects is under consideration.

The North of Scotland Hydro-Electric Board has generously increased its contribution, apart from the special provision it is making for wind power research; a request has been made to the D.S.I.R. for additional funds to widen the scope of this investigation beyond present resources.

D.C. Transmission

A year ago the new Section B was formed to pursue the study, which had been proceeding for two years previously, of d.c. transmission at high voltages. Exploration of existing knowledge, theoretical and economic, has shown that some aspects are too speculative at present for the issue of a general report to be profitable. It has also indicated the need for a trial system on an adequately full scale, which means heavy expense in rectifier and invertor equipment; the views of interested members are awaited. Meanwhile advice is being given to certain supply interests whose requirements may possibly be satisfied by the use of d.c., and a model-scale transmission system at Perivale has furnished information about system starting problems, control and stability.

Battery cell inquiries (primary and secondary lead-acid types) have not proceeded, but the immediate object of showing that a hydrogen-oxygen cell can function satisfactorily at appreciable current densities was reached with the recording of 200 A/sq ft and up to 600 A/sq ft at lower cell voltages. An application was filed in June, 1949, for a British patent covering a novel feature of the cell design. Further development might need costly facilities, so an effort is first being made to ascertain for what purposes such cells would be economic.

A report on the small heat pump at Perivale has been deferred for the inclusion of additional information; trial of the earth as a source of low-grade heat has begun. A report on household coal-electric systems of heating water has been held up for further investigations to clear up certain discrepancies between theory and experimental results. Immersion heater tests to determine the effectiveness of electrical and chemical

methods of scale prevention have not yet reached the report stage; "synthesized" waters are also being studied.

The analysis of the economics of earthing in relation to consumer protection has been completed. It has made it possible to arrive at the cost of providing a given standard of safety by each of the available methods and to draw conclusions about their relative merits. Consequently it has been agreed to recommend that the use of protective multiple earthing should be governed by regulations which will be less onerous than present ones.

The behaviour of earthing electrodes and various proposed methods of measuring the resistance of an earth fault path are being studied. Mr. G. F. Shotter has completed his extra-mural experimental determination of the relative suitability of different methods of detecting defined types of poor contact.

A means of detecting a.c. in buried water mains is being sought at the request of the Home Office, as is also the possibility of countering the increasing risk of fire associated with radio and television sets.

Agricultural Work

The financial support of the Ministry of Agriculture is enabling the work of the rural electrification section to be increased. Additional staff has been appointed and another laboratory building is to be erected at Shinfield. The development of crop drying processes continues; investigation of air-conditioned laying houses has commenced in collaboration with the Poultry Department of Reading University, as has also the use of high-frequency electric fields for pest control and milk pasteurization.

A small horticultural tractor, converted for electrical operation, has been used in both normal field cultivation and experimentally with results which encourage the belief that it will be satisfactory. Two glasshouses are to be erected at Shinfield for horticultural heating and illumination experiments.

A substantial proportion of the more fundamental research into insulation and dielectrics is, as formerly, carried on in conjunction with the universities and the N.P.L.; the Ministry of Supply supports other such work in which it is specially interested.

In connection with breakdown paths in organic materials, an oscillator has been installed (15 kV at 150 kc/s) which enables discharges equivalent to ten years' service at 50 c/s to be applied in two days. These paths seem to be formed in two ways; first in a gas-filled channel propagated by an erosive action of the discharge and, second, in a carbon-filled channel apparently propagated by the local field at its tip reaching the intrinsic electric strength of the material. An explanation of "heat developed" Lichtenberg figures (discovered by Thomas in 1944-45 and now known to have been observed by Swan in 1897) involves the presence of residual strains in the surface and reduction of the softening temperature near a charred particle trapped in the surface layer.

Mica and Oil Investigations

Preliminary examination of samples of mica, said to exist in appreciable quantities in central Australia, appear to suggest that large scale mining might be justified. The E.R.A. and B.S.I. are endeavouring to ensure that British procedure will be recognized by the Indian Standards Association in its efforts to introduce international standards for mica.

Soluble sludge in used insulating oil has been co-operatively investigated at the request of the C.I.G.R.E. by 26 laboratories in eight European countries. Co-operative tests of the power factor and resistivity of oil are likewise to be undertaken for the C.I.G.R.E. Recommendations are being drafted for a Code of Practice for testing and maintaining used oil; B.S. 148 (now being revised) applies only to new transformer oil.

A comprehensive data book (with alignment charts for quick working) on the electrical characteristics of overhead lines (being issued in parts to avoid delay) is believed to be a unique compendium. A pilot network analyser is now being installed and other special equipment is being made available.

The E.R.A. staff numbers 284. The abstracting service (300 British and foreign journals) caused the Information Bureau to receive over 2,500 requests for the loan of journals and documents.

Fault-Throwing Tests

Full-scale Experiments on 40 Miles of 132 kV Line

THE first carrier current protective equipment to be used on the 132 kV grid system was installed for the Central Electricity Board in 1931. Its performance was satisfactory, and between 1939 and 1944 nine equipments, operating in 0.05 to 0.1 sec were supplied by two British firms. Tests with a single 500 A generator indicated that there was no reason why they should not operate correctly when arcing faults occurred, with or without h.f. interference. During 1944, however, carrier current equipment on the 132 kV Northfleet-Woking feeder, which is about 40 miles long and includes 3.5 miles of oil-filled cable near its mid-point, occasionally failed to operate correctly, and normal small-scale tests failed to locate the cause of the trouble.

Consequently it was decided to carry out fault-throwing tests and these, together with the results obtained, were described in a Supply Section paper presented at an ordinary meeting of the I.E.E. in London last week by Mr. W. Casson and Mr. F. H. Birch (B.E.A.).

Object of Investigations

Six faults were applied to the grid in the normal way, and it was hoped that these tests would establish, first, whether incorrect operations were due to h.f. interference generated at the time of the fault, or to some other cause; secondly, strength and source of interference detected; thirdly, the effects of the oil-filled cable in the feeder upon any interference generated. In addition, the currents in the 132 kV earthed neutral connections at a number of stations in the neighbourhood were measured, and the Post Office made measurements of inductive interference in local circuits.

The tests took place in a temporary fenced compound on the North Downs, and the faults were applied by a set of three electrically controlled bomb-release-operated 132 kV isolators, a second set being employed to isolate the test equipment from the line. Between the line isolator and the fault-throwing switches three sets of horn gaps were arranged, across each of which fuse wire was connected. One side of each switch was connected to a horn gap and the other to a common bar which, except in the last test, was connected to an earth strap in the compound.

The test procedure and equipment embodied certain novel features, and special attention had to be paid to co-ordinating the activities of the large number of observers employed. The tests yielded the information sought with regard to power frequency currents and voltages, and the behaviour of switchgear when making and breaking large fault currents at full voltages. Much was also learnt about the general characteristics and appearances of power system fault-arcs, which were illustrated by films at the meeting.

Unfortunately, however, the results did not immediately reveal the cause of the incorrect protective gear operations during the war, but subsequent examination of the test records drew attention to certain unexpected phenomena which were later investigated by further tests. These phenomena were thought to be the cause of the trouble, and, to ensure reliable service in future, a somewhat larger output from the protective equipment would be advisable for similar feeders, so that less sensitive receiver settings could be used. It seemed that faults due to bombs and barrage balloons produced more interference than the faults normally encountered in peacetime, and it was doubtful whether carrier current protection of the design installed on the Northfleet-Woking feeder could be applied economically to feeders employing long lengths of cable.

DISCUSSION

Mr. C. W. Marshall (B.E.A.) opened the discussion with a reference to the reason for using carrier current protective gear. Distance protection of the reactance or impedance type had given reasonable performance with about 90 per cent efficiency, but

it was not possible to do any better with it, so it was decided to revert to unit protection, the least expensive form of which was carrier current gear. It was sold as high speed and absolutely discriminating. It was neither. As there was an interregnum between the C.E.B. and the B.E.A., the opportunity of conducting field tests was too good to be missed. Subsequently, carrier current gear had been made both rapid and discriminating. The authors spoke longingly of the opportunity to do further tests, but what amounted to an electrical observatory had been set up at Leatherhead and it should be possible to make proper analyses of the field faults which still occurred fairly frequently.

Mr. G. W. B. Mitchell (Merz & McLellan) said he stood quite close to the breaker at Northfleet during the last test and it cleared the fault without any fuss, with hardly any more noise than when tripped by hand with no current. That showed that the duty on breakers on an actual system was very much less than on a test plant. The power factor on the 132 kV system was about 0.3 and that made an enormous difference to the breaker. For normal types of fault, there was a good deal in hand with properly tested modern breakers on an actual system.

B.E.A. Experience

Mr. F. J. Lane (B.E.A.) said that one reason for the tests was the decision to depend entirely on the carrier equipment for the protection of the circuit whereas from American journals it would be seen that, in general, if carrier equipment were applied some form of back-up was provided also. Experience since the war had proved the protection to be both fast and selective. The year before last there were 34 faults, all cleared correctly; last year only two faults were not cleared. There was difficulty in designing impedance and directional relays for rapid operation because of the difficult conditions in the first few cycles. That was one of the reasons for the change, which was now gradually being made to the phase comparison type of protection. Another reason was to eliminate the directional relay, which was one of the uncertainties in interlocking protection, and the cost of special voltage transformers.

In this country it was not possible to be sure that over a long period of years all overhead lines would necessarily remain entirely overhead. When planning a system it had to be borne in mind that owing to the construction of aerodromes, new towns and so on, sections of the feeder might have to be put underground sooner or later. It would be foolish, therefore, to develop a system of protection which could not be applied to circuits having short lengths of 132-kV cable. That was another reason why the tests were important.

Mr. E. P. L. Westell (G.E.C.) said that the tests described were of inestimable value to the telecommunication engineer responsible for the design of carrier equipment for communication purposes over power lines. Even before the war such tests, even on a small scale, were very rare, owing to the risk and expense involved. Carrier communication equipment had therefore to be designed particularly with regard to noise and interference, on theories which had not been thoroughly tested in practice.

Post Office Viewpoint

Mr. J. J. Edwards (G.P.O.) said that the tests, from the Post Office point of view, were not ideal, because of the complications of double circuit lines and the Post Office exposure being near the faults; also because of the variations of earth resistivity which were known to occur under such conditions. In the ordinary way such things could be calculated from known theories, but it was always useful to have tests to confirm the measured values, because it was obviously uneconomic for the power industry and the Post Office to provide protection which was not really required. The main points of interest to the Post Office in the tests were the screening effect of the Post Office cable, the possibility of a propagation effect in the induced voltage along the length of the P.O. line, and the protection of personnel.

Mr. R. K. Edgley (Reyrolles) said that carrier protection of the directional interlocking type had now been largely superseded by a more modern design working on the phase comparison principle. It would be of value to examine the data available to determine whether such protection would operate satisfactorily under all conditions met with in practice, or whether the interference which might arise might adversely affect this type of protection. For this purpose it was desirable to examine the nature of the interference as well as its causes. There was evidence that the interference might be of the nature of pick-up rather than direct injection. It had been shown that h.f. interference arose at the time of opening and closing of circuit-breakers in series on a line which were outside the line traps which limited the path of the legitimate h.f. signals. If series arcing were to occur between the line traps, due perhaps to a broken conductor fault, the interference produced would be much greater and might be detrimental to the correct operation of the protection.

Mr. W. T. J. Atkins (B.E.A.) mentioned that the authors drew attention to the odd

behaviour of their voltages and remarked that when a fault occurred at the top of a peak a good deal more subsequent distortion took place than when it happened as the voltage was more or less passing through zero, and they proceeded to comment upon its behaviour in the residual circuit in particular.

He suggested that this might be a spurious effect, due to the measurements being made via capacitor type voltage transformers, which were, in effect, rather sharply tuned circuits, so that one was looking at a rather jerky signal through what was virtually a band-pass filter. It was not astonishing, therefore, to find that there was a good deal of distortion and apparent displacement of phase, which might not be as real as it appeared to be.

Referring to the pioneering nature of the work described, he said that he had looked in vain for accounts of anything at all resembling it in published reports. He was sure that if anything of the kind had been done abroad we should not have been left in the dark about it.

Calculation Methods

Mr. G. Lyon (A.E.I.), who was responsible for the a.c. tests, said that the agreement between the three sets of results was very good and tended to support the view that the methods of calculation used were adequate, and that the d.c. short-circuit table was sufficient for the class of work described. It was important to bear in mind the assumptions which underlay the calculation methods. Load current and loading conditions generally were ignored and the test based on internal voltages common to all generating sources and equal to the open circuit terminal voltage. These assumptions were justified for the conditions of the tests, which were on a comparatively lightly loaded section of a network which was fairly uniform in character, but care must be exercised in extending the good results obtained to other conditions on other systems, where the load currents might be comparable to the fault currents and the internal voltages of the generators widely different, owing to the different power factors at which they were operating.

Mr. L. Gosland (E.R.A.) agreed that the authors' explanation of the cause of carrier interference—that it was due to capacitance sparking—was perfectly satisfactory, but was not convinced that the conditions which they suggested could arise with barrage balloons could have happened so frequently as 12 times out of 24. The tests seemed to have cleared the arcs from the suspicion of causing the trouble, but the test conditions for the arcs were remarkably easy. The conditions might be quite different with a strong wind blowing and with the arc between the conductor and a part of the tower where the electro-magnetic forces were very different from the simple kind found in the test set-up.

Mr. J. P. Cranmer asked whether similar interference trouble was likely to be experienced with a post-war design of oil circuit-breakers, which would give a total clearance time of 0.03 sec as compared with the 0.15 sec mentioned in the paper.

Mr. G. J. Maughfling asked whether any complications had been anticipated from the length of cable in the circuit, and Mr. W. de Bruyn asked whether previous records had shown any difference in the frequency and intensity of the current generated according to the distance of the fault from the cable end.

Mr. F. H. Birch, who replied to the discussion, said he did not know whether modern circuit-breakers, using resistance switching, would produce less interference, but they were not bothered by interference produced by circuit-breakers because they could make provision against it. Careful tests were made to determine the attenuation of the cable section and its h.f. characteristics, but they had not visualized at the time that the protection would have to meet war-time conditions.

Americans and Cairo Contract

A *REUTER* message states that the Westinghouse Electric International Co. will take the Egyptian Government to court on 13th March in an effort to regain a lost £1,700,000 contract for establishing an electric power station in North Cairo and supplying the necessary equipment. The Cairo agent of the company alleges in a written plea that "the existence of political differences between members of the Government" was a motive for opposing the Westinghouse contract.

Westinghouse received the contract but the decision was cancelled and the tender of the French Alsthom concern of France was accepted. Payment in the case of Westinghouse was to be in dollars but in the case of Alsthom it would be in Egyptian pounds. In the written plea which will come before the court the Westinghouse agent claims that "factors not related to the public interest have led to the acceptance of the offer of the French firm."

The Egyptian Government contends that the matter is not within the jurisdiction of the administrative courts. It also denies the agent's allegation that political differences and influences led to reversal of the decision.

VIEWS on the NEWS

By REFLECTOR

THE Eastern Electricity Board is gently chided by the *Hornsey Journal* for the lack of the "local touch" in its annual report. The *Journal* refers with approval to the former reports by the borough electrical engineer and says that "Hornsey people cannot be expected to be particularly interested in the report of a Board which, because of the vast region covered, seems to be remote and impersonal." It is, indeed, a pity that this should be so and there is something to be said for the suggestion that there should be annual reports by the district managers. It would be too much, however, to embody these in the Board's general report; there are 43 districts in the Eastern Area. There is a possibility that brief district reviews could be prepared by the managers for publication in the local Press; these would meet the requirements to a considerable extent.

★ ★ ★

Mr. R. E. Bristow, managing director of B. & S. Electrical Contractors, Ltd., tells me that I didn't get the wording of the sign on the company's premises at Guildford quite right. A copy which he has sent me shows a monkey playing with the element of an electric fire and generally tangled up with electrical gear. At the top is the warning, "It is not wise to monkey about with electricity," followed by the advice, "Let us repair it."

★ ★ ★

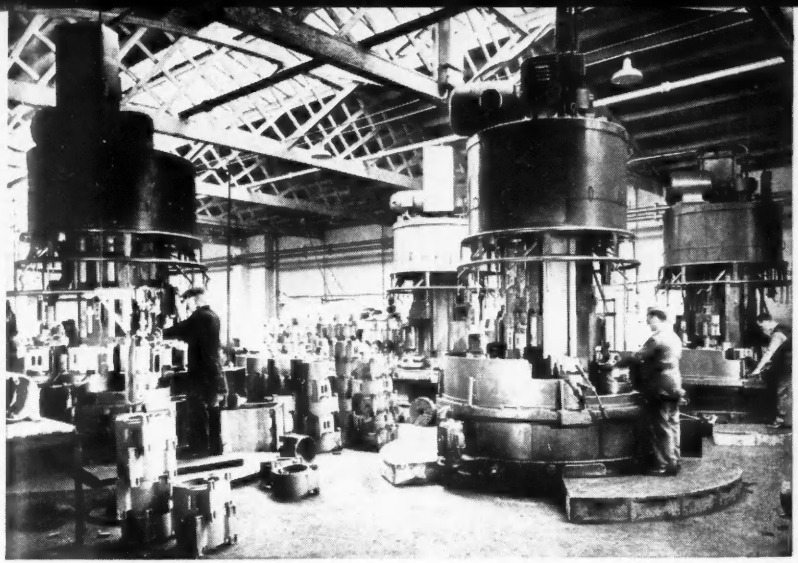
The B.E.A. might be glad of a good load on Saturday afternoons, but I do not expect it to treat very seriously an idea hinted at in a football commentary appearing recently in the *Morning Advertiser*. The writer was dealing with the cancellation of Rugby League matches because of frost-bound grounds and said that all manner of devices had been tried in an endeavour to overcome this. There had been talk of electrically heated tubes placed under the turf. But why not soil-warming cable? For horticultural purposes something of the order of 5 watts per sq ft is recommended. On this basis a Rugby football ground measuring, say, 110 by 75 yards, would need 371 kW. Even if only half of this were really necessary it would still be a pretty substantial load, and also a nice job for an electrical contractor. I do not know how many Rugby League grounds there are, and there is also the Rugby Union. And what about the spectators? Are they not entitled to a little warmth, too?

★ ★ ★

At an inquest on a young woman who received a fatal shock while carrying a switched-off electric fire across a room the Coroner said that the appliance was a shoddy wartime product to which "dangerous modifications" had been made to increase the loading. This reminded me of the complaint I had to make several times during the war that although reputable manufacturers were unable to make electric fires and other appliances many fly-by-night concerns were producing all kinds of rubbishy devices. I had hoped that by this time they had all been burnt out and discarded, but there must still be some about. Not all post-war equipment is perfect, but the general standard is, I believe, a good deal higher.

★ ★ ★

Visits of inspection to electrical utilities are arranged for all kinds of people in the United States, but apparently not for bartenders. Deprecating this, the *Electrical World* says that "for sheer volume of opinion that passes over it, nothing is the equal of a bar." Consequently the bartender may be in a good position to influence public opinion for or against the public utilities, but I think it is going rather far to exclaim: "Successful indeed and proud can that industry or company count itself that earns and holds the respect and support of such as he, philosopher, thought reader and counsellor to the passing parade."



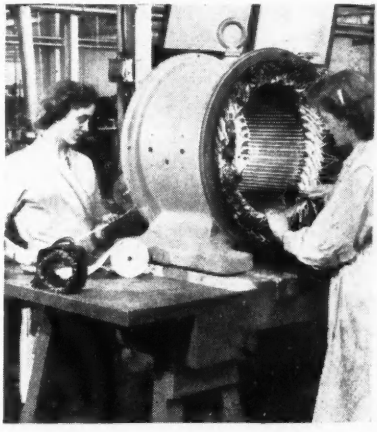
Motor yokes are being bored in these recently installed multi-head automatic boring machines

Increasing Production

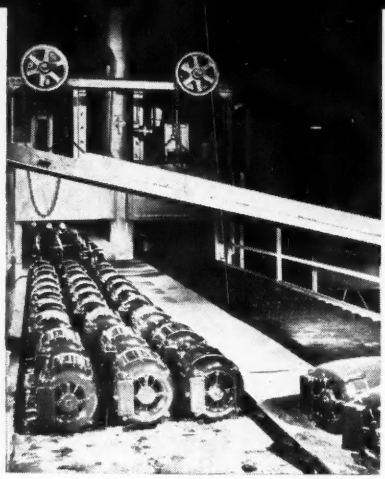
Recent Developments at the Works of Brook Motors, Ltd.

SINCE we last visited the factory of Brook Motors, Ltd., at Huddersfield three years ago very considerable developments have taken place. Not only have extensions been built and additional premises acquired, but the layout and manufacturing facilities throughout the works have been almost completely reorganized with a view to securing a smoother production flow, so increasing output. Furthermore, besides introducing a number of new lines, the opportunity has been taken to redesign a large proportion of the company's range of electric motors and starters to conform to modern practice, especially with regard to space saving.

For many years the company, which claims to be the world's largest exclusive maker of a.c. motors, has been able to announce in its advertisements that it produces "A Motor a Minute." By three years ago this figure had been reduced to about 50 seconds. The new developments have so far improved this record that a completed motor now leaves the production lines every 37 seconds.



Completing a rewind in the repair department



Fractional h.p. motors emerging from the oven after they have been stove enamelled

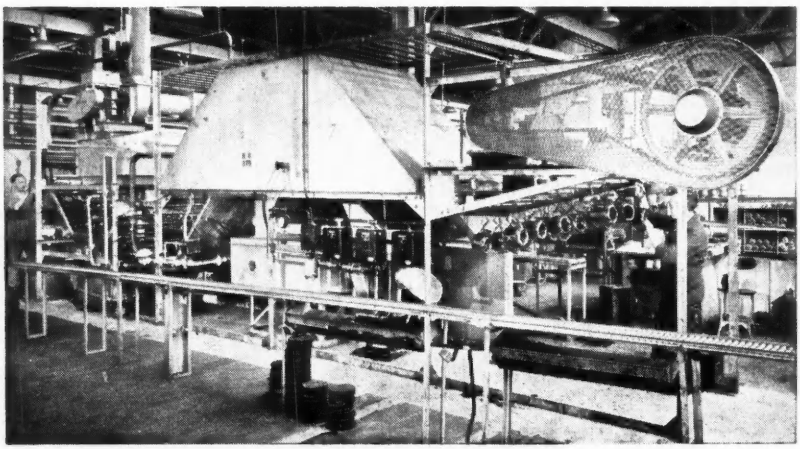
Over ten acres of land are now occupied by the nine factories which go to make up the Brook works at Huddersfield. In addition, there is a branch factory at Barnsley, a few miles away. One of the most important of the recent changes is the complete remodelling of the yoke department for the 1-25 h.p. range of motors.

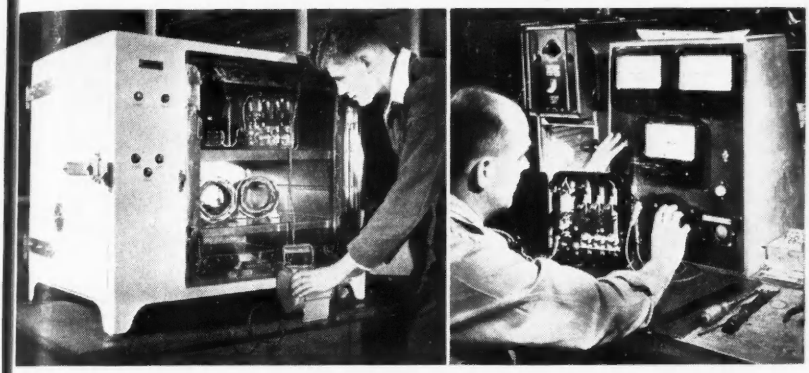
The castings, which have been fettled and given their primary coat of paint in "No. 9" factory, are now dealt with by flow production methods. Instead of capstan lathes, Bullard "Mult-Au-Matic" multi-head automatic borers are used to enable seven separate boring operations on the yokes to be carried out simultaneously, each machine having eight work heads (seven actual machining spindles) with dual indexing. Roller conveyors then carry the yokes to 4-spindle multi-drilling machines which make all the necessary holes in one operation. Further roller conveyors take the yokes on to the paint spray booths and from there into a new main assembly department.

Improved Winding Methods

Among noteworthy features of the equipment of this new department is the use of a lighter type of winding frame which is much more convenient to use. Adjoining this section a new load-testing station has been provided. Incidentally, in the "Cub" fractional h.p. motor department the use of eddy current dynamometers enables every unit to receive a load test in a few seconds. The larger motor section (over 25 h.p.) is at present in course of reorganization. Here, as elsewhere in the factory, can be seen evidence of the company's efforts to eliminate manual handling especially by the use of electric hoists. Conveyors are

Impregnation and baking of "Cub" fractional h.p. motor stators, utilizing a new convector oven





Humidity chamber in research department enabling tests to be carried out under tropical conditions and (right) test panel for control gear showing an automatic contactor undergoing tests

employed wherever this is found to be practicable.

A particularly interesting recent labour saving innovation adopted throughout the works is the electrification of all the sliding doors between the various sections of the factory. Push-button control is provided, the company's "Cub" motors used being fitted with limit switches at each end of the run. Altogether twenty doors are so equipped.

Several steps have been taken to secure an even better finish of products. Apart from greater care in fettling and preparing the castings, new continuous convection-type ovens have been installed for impregnating and baking both the fractional h.p. and the 1-25 h.p. ranges of motors.

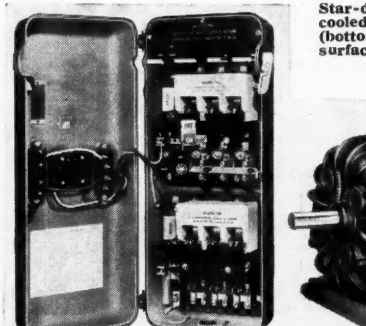
Both improved performance and increased production are expected to result from the substitution in some cases of synthetic resin covered for cotton covered wire for windings, it being possible to get more copper in a given space and at the same time eliminate the process of covering the wire with cotton.

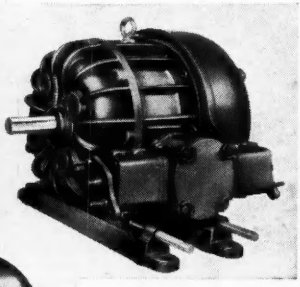
Following the rearrangement of the factory the progress department is now at the end of the production line in the correct place for checking. In addition to a new stock department an entirely new despatch building has been provided, arranged so that one conveyor line deals with home orders and another with apparatus for export. Another new building houses export cases awaiting shipment.

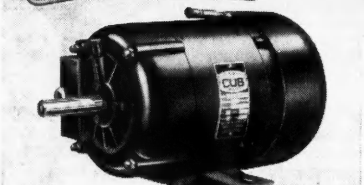
Main dispatching and sorting conveyors for home orders. Export orders are dealt with in the department just visible on the left

Facilities for Research

The research department has been moved and expanded and improved facilities are now available for testing equipment under the most extreme conditions liable to be encountered at home or abroad. A new repair department now fully established is entirely self-contained, and has its own machine shop and winding sections. Here also are made stator-rotor units and in one corner







Star-delta starter, surface-cooled flameproof motor and (bottom left) totally enclosed surface-cooled "Cub" motor

is a diecasting section where such components as retaining rings, terminal box covers, etc., are produced.

Among the several new items which have been brought out recently one of the most interesting is a surface-cooled flameproof slip-ring or squirrel-cage motor which has been developed largely as a result of inquiries from overseas for apparatus for oil fuel pumping stations. It is available in sizes from 0.75 to 50 h.p. and holds F.L.P. Certificates for Groups 1 and 2 gases.

A new variation of the "Cub" fractional h.p. motor is a totally enclosed surface-cooled unit suitable for use in excessively damp or dirty conditions. Heat is dissipated by a fan at the non-driving end which is protected by a pressed-steel cowl. It has a slightly higher output in relation to frame size than previous types. A single-phase two-speed dental lathe is another new "Cub" unit.

The adoption of new ideas in plastic mouldings, coupled with the use of die castings and sheet-metal pressings, has resulted in exceptional compactness of a new three-phase totally enclosed star-delta starter complying with B.S. 587. The contactor panels are resiliently mounted and there is no-volt and overload protection. Automatic push-button control with on/off indication is provided, together with an isolator switch. For use in machine tools a flush-mounting model of the company's automatic direct-on-line switch unit is now available.

Voltage Stabilization

IN almost every branch of research and in industry there are many instances where an a.c. supply of inherently high stability is required, particularly for instrument and meter calibration. This can only be obtained from some sort of stabilizing equipment, but up to the present time few stabilizers have been designed with stabilities of the order of 0.1 to 0.01 per cent.

Quite a few readers will, therefore, be interested in a paper presented before the Measurements Section of the I.E.E. in London this week by Dr. G. N. Patchett (Bradford Technical College) in which is described a newly designed precision a.c. voltage stabilizer. The paper opens by dealing with the advantages and disadvantages of various basic stabilizer arrangements and then considers in detail a special type of "indicator" using a thermistor. The theory of two types of "controller" as used by the author is then discussed, the first being more universal in its application, but the second capable of dealing with greater outputs.

The design of a stabilizer of high accuracy using the previously mentioned thermistor indicator is then discussed in detail, and performance figures quoted with reference to changes in frequency, input voltage, output current, ambient temperature and valve characteristics. Such a stabilizer can be produced with a stability of 0.01 per cent and with an output of up to 2 kVA.

Apart from providing much useful information with regard to voltage stabilization technique in general this paper sets out the fundamental features of design of a piece of equipment which will fulfil the requirements of many electrical engineers.

The Year's Progress

Further Details of the Activities of Electrical Manufacturers in 1949

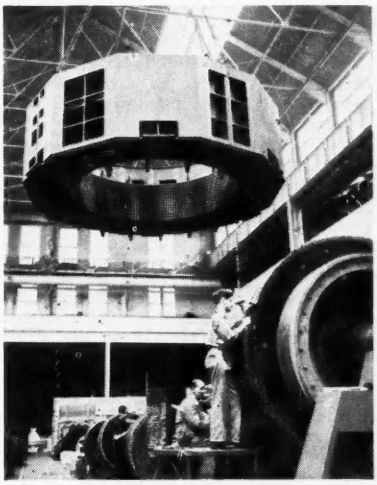
IN the course of last year the second hydrogen-cooled 60 Mw generator was dispatched by the **Metropolitan-Vickers Electrical Co., Ltd.,** to Littlebrook, two 55,555 kVA at 33 kV sets to Pyrmont, Australia, two 63,430 kVA sets to Croydon, two 56,250 kVA sets to Cliff Quay, Ipswich, all of 3,000 r.p.m., while one of 67,130 kVA at 1,500 r.p.m. went to Neepsend, Sheffield. The first hydrogen-cooled machine for Battersea, the third to be manufactured at Trafford Park, of 66,667 kVA at 3,000 r.p.m., is ready for dispatch, as are two 62,500 kVA 33 kV, 3,000 r.p.m. machines for Agecroft, Salford. Of new plant put in hand during the year, the largest is a two-axis unit of 100,000 kW for Battersea "B" which will in general be a duplicate of the existing machine there.

Generators commissioned during the year included the 75,000 kVA at 3,000 r.p.m. hydrogen-cooled machine at Littlebrook, which was the first hydrogen-cooled one to be manufactured and run in this country; it is now operating normally.

Of the twenty-seven turbine sets ordered, twenty-three are for overseas installations. They include three 30,000 kW at 3,000 r.p.m. single-cylinder back-pressure turbines for the State Electricity Commission of Victoria which will operate at 1,250 lb/sq in, 915 deg F and exhaust at 28 lb/sq in for drying small coal in the Morwell briquetting works.

Geared a.c. generators completed and dispatched during the year are all of the standard solid-pole construction, including three 6,250 kVA at 1,500 r.p.m. and three of the same output at 1,000 r.p.m., all for export.

Orders have been received for two open-cycle gas-turbine generator sets. That for the Metropolitan Water Board is of 2,500 kW to operate on gas oil for stand-by at Ashford Common pumping station. The other for Shell Petroleum Co., Ltd., is to be installed in Venezuela, of 1,750 kW and designed to burn natural gas. Each will include a fifteen-stage axial flow compressor with a four-stage turbine coupled directly to the compressor driving the alternator through single reduction gearing, without a heat exchanger.



Stator of 14,100 kVA vertical shaft generator driven by water turbine for Moyar, India. The armature illustrated below is for a rolling mill motor supplied to S.I.D.A.L., Belgium

All the orders for water turbine a.c. generators during 1949 came from abroad; they included four for Australia and two for Iceland. The first and the second 18,000 kVA vertical shaft units for 75 r.p.m. at Tainionkoski (Finland), which were dispatched without prior works assembly or test, were erected without serious difficulty and immediately put into commercial service; the third machine is being erected.

The first 8,333 kVA at 167 r.p.m. vertical shaft machine for Pitlochry (Scotland) has been dispatched and the second is being prepared for works tests. Two identical machines for the Tor Achilty station of the same scheme are on order. One of the three 19,000 kVA at 500 r.p.m. generators for the Dutch East Indies was

dispatched and several generators are well advanced in construction.

Last year was noteworthy for the number of synchronous condensers completed. Two of 15,000 kVA and two of 30,000 kVA were despatched to Spain, a third of 30,000 kVA at 15 kV has been tested and a fourth is nearing completion. Recent orders include three of 30,000 kVA at 12 kV for Spain and seven of 20,000 kVA at 10.5 kV for the Electric Supply Commission of South Africa which are interchangeable with the many similar ones already supplied to this particular customer. All these machines and also one of 40,000 kVA 22 kV now under construction for the Victoria State Electricity Commission of Australia are of standard solid-pole construction for 1,000 r.p.m.

A 100 MVA, three-phase, 220/15/10.5 kV, three-winding transformer group has been installed at Lutterade, Holland, to link the 150 kV Dutch network to the 220 kV Ruhr network. Other export shipments went to Finland, South America, India, South Africa and European countries.

The demand for instrument transformers both for home and abroad continues; voltage transformers now on order for 110 kV and higher exceed two hundred, including eighteen for 220 kV; many orders for separately mounted high-voltage wound-primary current transformers are mainly for air-blast switchgear at up to and including 220 kV.

The demand for transductors has continued to increase, ranging from small dry types for the initial stages of magnetic amplifiers to oil-immersed types of 100 kVA; applications include grid control of rectifiers, the control of motor fields, etc.

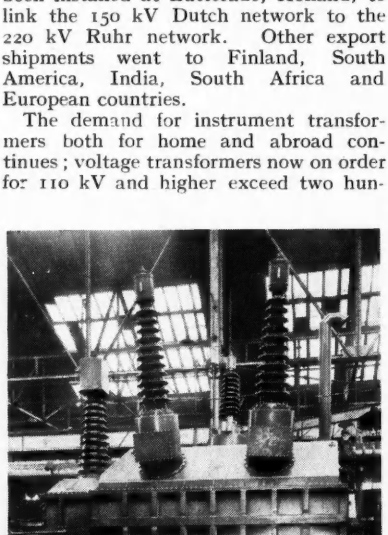
A 1,500 kW steel-tank pumpless rectifier set commissioned at Templeborough rolling mills is completely withdrawable from its cubicle; it is the first so manufactured in this country.

In Finland 110 kV breakers have been put into commission and the first three-phase at 220 kV air-blast breaker supplied from this country has been received.

The demand for fuse-switch distribution boards has increased while that for indicating instruments continues constant throughout the range, but the call for automatic voltage regulators of all types has been greater than ever before.

There has been an increased output of medium-sized motors. An impregnation plant for treating stators with bitumen under pressure is now in use and an automatic varnishing plant for stator punchings was recently installed with a capacity of approximately 2,000 medium sized punchings per hour, each automatically conveyed through the varnishing rollers, drying oven and cooler. A second and larger plant to be installed will extend the practice of rotor casting to some larger sizes.

At the A.E.I. Birmingham works new plant is now increasing the production of small a.c. motors with frames and end-shields die-cast in zinc alloy. New designs of variable speed a.c. motors are being introduced. At Coventry a plant is being installed to increase the output of the larger sizes of f.h.p. motors, which will have die cast aluminium endshields and bases in future. At Newcastle-under-Lyne the manufacture of semi-standard f.h.p. motors and the handling of repair work have been separated from the general standard production. The demand continues to increase for motors with a closed air circuit and water coolers. Motors of this type as small as 350 h.p. are on order; the coolers are mounted either on top of the motors or underneath.



One of three single-phase units forming a 100 MVA three-phase 220/150 kV bank of Metropolitan-Vickers transformers made for the Directorate of Power Supply, Holland

European Power

Pumped Storage Hydro-Electric Projects

SEVERAL power development proposals were studied at the mid-January meeting in Geneva of the Committee on Electric Power of the United Nations Economic Commission for Europe (*Electrical Review*, 27th January). The object was to consider how national efforts may be assisted by international action for relieving the shortage of electricity, which may amount to 20 per cent and perhaps persist for some years.

Power Export

The possibility of power generated in Poland and Czechoslovakia being exported to Western Germany was examined. The schemes are considered to be complementary in that the first stage of making 13 to 40 MW to be developed in Czechoslovakia available to Bavaria over a new 110 kV line might not be economic if not followed by, at least, the full use of 150 MW proffered by that country and, in due course, the initial offer of up to 300 MW by Poland.

The proposals might form part of an international system; a concrete proposal is to be submitted as soon as possible to enable external financial assistance to be sought.

Possibilities of a variety of projects in Austria helping other countries are being studied.

The E.C.A. Power Committee was informed that the third variant of a scheme for water power development in the River Our valley in Luxembourg had recently been accepted as final by the Government of that country and representatives of neighbouring countries. Agreements are now being negotiated for the sale to Belgium, France and the western zones of Germany, at their peak periods, of energy generated by the release of water from pumped storage basins in Luxembourg which would, in turn, purchase energy at night from Western Germany to assist thermal pumping stations to replenish the water in the reservoirs.

The approved version of the scheme will provide an installed capacity, in alternators, of 600 MW with the possibility of an additional 200 MW.

On the recommendation of the Hydro Working Party under the chairmanship of Mr. Marco Visentini (Italy) the secretariat has been asked to publish each year a catalogue indicating by country and source of energy (a) total available installed capacity, (b) plant under construction with date of expected operation, (c) additional capacity that could be economically installed, (d) information about productive use of principal hydraulic basins during previous year and (e) information about proposed plant installations. The secretariat was also asked to study the unused overflow from hydro basins in various countries in Europe and to compare construction costs of hydro-electric stations.

At the request of the Thermal Working Party, under the chairmanship of M. Pierre Smits (Belgium), the secretariat was asked to revise its examination of daily pumping requirements, to compare prices of electric power in various countries at different times of the day and year, and to ascertain whether abundant cheap power exists which can only be used for pumping.

H.V. Interconnectors

The secretariat's comparison of costs predicts a trend towards the use of 380 kV trunk transmission lines for the European network, as likely to be cheaper than long-distance 220 kV lines. It also indicates that the transport of coal by rail at prevailing freight rates over distances exceeding 200 km is generally more expensive than the transmission of power by normally loaded 220 or 380 kV lines. The conveyance of coal by inland waterways may, however, be cheaper in some cases than the transmission of power.

The secretariat is to study the legal aspects of electric power "in transit" through several States and to compare national legislation on the export of elec-

tric power. A provisional report of 250 pages on the legal aspects of the hydro-electric development of international waterways and lakes has already suggested that the conclusion of "general international conventions" might help to prepare the way for subsequent unification of legislation for projects of this kind.

This report states that "the time hardly seems ripe, however, for a standard general convention." Therefore, in each specific case, agreements must be sought between the States concerned. To assist negotiations of this sort, the secretariat has been instructed to pursue its documentation of relevant information

ALUMINIUM SHEATHED CABLE

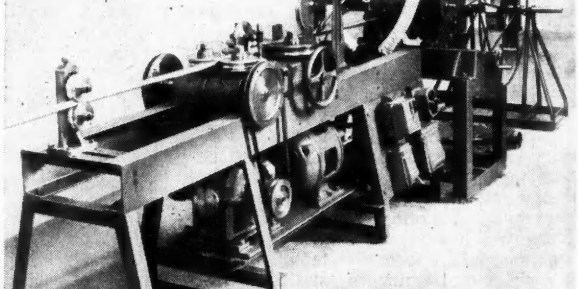
Cold Pressure Welding Method

AN interesting application of the cold pressure welding process developed by the G.E.C. is to be seen at the factory of Pirelli-General Cable Works, Ltd., where a machine has been constructed for the production of aluminium sheathed cable on a commercial scale. Essentially, the process comprises four stages—flange forming, preparation of flange surfaces, introduction of cable and formation of tube, pressure welding and removal of flanges.

First of all, aluminium strip is drawn into a pair of rollers through a feed spool at the rear of the machine. The strip emerges as a trough with two horizontal flanges and passes to two rapidly rotating steel scratch brushes which prepare the mating surfaces for cold welding. The cable and incomplete sheath are then brought together and passed through two horizontal tube-forming rollers to the welding rollers, where the projecting flanges are welded together and the excess trimmed off. To remove any remaining roughness the sheathed cable passes through a final stage consisting of a pair of vertical peening rollers.

The sheath produced by this method is continuous, the aluminium strip being joined where necessary by a method of brazing which does not interfere in any way with the welding process. The machine is adjustable to suit varying diameters of power and telephone cables of up to 1.5in overall diameter. Another machine is being developed for sheathing similar types of cable, and will be particularly suitable for aluminium sheathed house wiring cables of the flat-twin and other types.

Cables sheathed by the cold pressure welding process pass the appropriate bending tests and are lighter and mechanically stronger than their lead-sheathed counterparts. There is thus little doubt that they will have a considerable field of usefulness. Any type of cable can be sheathed on the machine, including rubber and plastic, dry-core, mass-impregnated, pre-impregnated, or even oil filled cable, if required. An important feature of the process is the complete absence of heat during sheathing. This enables some dielectrics to be sheathed which cannot easily be dealt with by more conventional methods.



Pirelli - General cold pressure welding machine for aluminium sheathing of cables

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents

Pole Erection

APROPOS Mr. Harley's description of a new pole erection lorry being used by the Midlands Electricity Board (*Electrical Review*, 3rd February), you may be interested to know that a special unit of Royal Engineers first tried similar equipment in Holland at the beginning of 1945.

The unit was the 21st Army Group Power Company, then engaged on the provision of nearly twenty miles of 70 kV line. In that very difficult lowlands terrain several unconventional pole erection methods had to be introduced. These included utilization of Royal Engineers' well-boring rigs and well-boring augers. The latter had detachable "bits" in sizes from 12in to 42in diameter.

I see from my notes that on the best sites, *i.e.*, firm sandy loam more than 7ft above the water table, we drilled for and placed a pair of "H" poles in 20 minutes—thus easily beating the Midlands Board times. T. G. MARTIN.

Camberley, Surrey.

Ring Mains

AS one of the first to mention in print the abuses of the ring main, as far back as December, 1947, when I stated my opposition to this system, may I give my support to Mr. Alex. Milne. Mr. R. Amberton and I have crossed swords before on this accessory, namely, the 13 A plug and socket, and I am surprised to see Mr. T. C. Gilbert supporting a non-standard plug and socket. From my experience there is no doubt that the B.S. 1363 plug is the better accessory and some of them are not all to be desired, there being one and one only 13 A plug top that cannot be tampered with. I have seen this system abused and left in a more dangerous state than when an orthodox system has been tampered with.

From the remarks of your correspondents it would appear that it was primarily introduced for the council type of house, but it is here that the architects and planners fell down, as at every housing site that I know of where the ring main has been used all the plug tops were supplied with a fuse of 13 A rating, no thought being given to the fact that some of the plug tops would be fitted to reading lamps, irons and other small appliances. Therefore, if this fuse is abused, as it often is, then they rely on the 30 A fuse in the main switch.

Furthermore, councils do not send representatives round to their tenants advising them on the use of this circuit; they are allowed to connect wash boilers, grillers, fires, etc., without any idea that they may be overloading the main. There can be no doubt that the general public has not been educated in the use of the ring main, otherwise householders would know that they can buy 3 A and 7 A fuses and what to use them for when bought. I would like to ask where the blame for this mismanagement lies.

F. R. YEARSLEY.

Lyndhurst, Hants.

THE opinions expressed on this subject have been interesting and I have pleasure in replying to your correspondents. Answering Mr. Gilbert I would state that my remarks regarding business premises may have been a little confusing as I am given to understand by the advocates of the ring main that it is principally applicable to houses and we need therefore not take business premises into account. The answer to the question is not so easy as Mr. Gilbert would have us believe because it is very seldom that the required number of outlets are fitted with any system.

As I have examined hundreds of domestic and other installations which would beggar description I do not wish to see anything introduced which would aggravate the position and that is precisely what the general use of the ring main would accomplish.

To Mr. de Gruchy I would say that any

system of installation is likely to be well carried out by an electrical engineer in his own house but we have to consider the hordes of incompetents who are engaged in the installation industry.

Mr. Davidson thinks I have a sneaking regard for the ring main system and indeed in different circumstances I might even be writing boosting the system.

Glasgow, C.2. ALEX. MILNE, SENR.

I.E.E. CENTRE EVENTS

North Western

THE annual dinner of the North Western Centre of the Institution of Electrical Engineers will be held on 14th March at the Midland Hotel, Manchester. Applications for tickets (18s each) should be made by 13th February and can be obtained from Mr. A. L. Green, 244, Brantingham Road, Chorlton-cum-Hardy, Manchester, 21, and Regent House, 30, Cannon Street, Manchester, 4.

As one of the social functions to celebrate the fiftieth session of the North Western Centre, the Committee has decided to hold a week-end outing on 20th and 21st May. On the Saturday it is proposed to go by coach from Manchester to Lancaster where a visit will be made to the linoleum mills of James Williamson & Son, Ltd. From Lancaster the party will proceed to Morecambe, and on Sunday there will be a coach tour of the Lake District, returning to Manchester in the evening. The approximate cost will be £3 10s per person, and members' wives, families and friends may take part.

South Midland

Only by technological advances will it be possible to offset the threefold increase during the past fifteen or twenty years in capital cost of providing electricity. This statement was made at Birmingham last Friday by Sir Henry Self, deputy chairman of the B.E.A., at the annual dinner of the South Midland Centre of the Institution of Electrical Engineers.

Referring to the recent B.E.A. report, Sir Henry said that the electrical industry was clear of politics and he hoped it always would be. He said that criticism should be fair and objective. If the Government had to divert a large proportion of production to export and imposed capital cuts on the industry, it was inevitable that the plant programme would not keep in step with needs. While the generation side had not been affected by the cuts, the Area Boards would have to "take the jolt" in the distribution system. There must be a lag in the overtaking of demand by the supply with the plant available, and efforts must be continued to improve load factor by securing a diversity of load. The industry was faced with a greater challenge in technological advances than ever before.

The meeting was presided over by Mr. J. W. Donovan, chairman of the Centre, other speakers being the Lord Mayor of Birmingham, Alderman H. Humphreys; Professor E. B. Moullin, President of the I.E.E.; Mr. D. H. Kendon, senior vice-chairman of the Centre; and Sir George Nelson, chairman and managing director, English Electric Co., Ltd.

E.A.W. Activities

MISS MARJORIE GORDON, head of the Physics Department, Cheltenham Ladies' College, and holder of the fifth Caroline Haslett Travelling Exhibition, has recently returned from the United States, where she visited universities, colleges and schools, and on 24th January, at the Institution of Electrical Engineers, she gave a lecture on "Teaching Electricity in Girls' Schools in the United States," in the course of which she gave an interesting account of American methods of teaching electricity in physics, science and home economics.

The Perth Branch of the E.A.W. was formed in January. The chairman is Mrs. John Stewart and the hon. secretary, Mrs. Grant. Among the speakers were ex-Bailie A. F. Silver, Perth's housing convener, and Lady MacColl, president of the Glasgow E.A.W. Branch, and chairman of the Scottish Council. A Worcester Branch was also formed in January at the meeting in the Guildhall, when Mrs. H. M. Lettice became chairman, and Mrs. A. J. Smith, hon. secretary. The Mayor of Worcester, Ald. T. S. Bennett, was present together with the Mayoress.

The Seattle Contract

SIR CECIL WEIR, chairman of the Dollar Export Board, returned to England on Sunday last after a visit to Canada and the United States. Sir Cecil said that there was undoubtedly a willingness, in Canada particularly, to increase trade with this country. He referred to the rejection of British tenders for electrical plant by the Seattle (Washington) municipal authorities and said that he had discussed the matter with the Economic Co-operation Administration, which had told him that the equipment offered did not conform exactly to the specifications. He intended to pursue the matter further.

PERSONAL and SOCIAL

News of Men and Women of the Industry

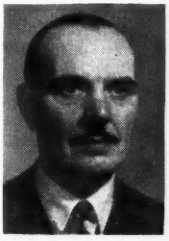
THE Minister of Fuel and Power has appointed **Lt.-Col. D. S. Kennedy,** D.S.O., J.P., M.I.Mech.E., M.I.B.A.E., of Andover, Hants, to be a part-time member of the Southern Electricity Board.

Sir Harry Railing, chairman and joint managing director of the General Electric Co., Ltd., accompanied by Lady Railing, sailed on the *Pretoria Castle* on 2nd February for an extensive tour of South Africa, during which he will visit the head office and branches of the British General Electric Co., Ltd., at Johannesburg, Cape Town, Port Elizabeth, Durban, Salisbury and Bulawayo.

Mr. I. A. R. Stedeford, chairman and managing director of Tube Investments, Ltd., is leaving Britain by the s.s. *Queen Elizabeth* on 15th February on a business tour, during which he will visit the United States, Australia, New Zealand and South Africa. He will be accompanied by **Mr. E. D. E. Andrewes,** managing director of the Tube Investments export organization, TI (Export), Ltd., and he will return to England in mid-April.

As we reported at the time, membership of the **British Electricity Authority** changed at the beginning of the year when the first four Area Board chairmen ceased to be part-time *ex officio* members and were replaced by four others—Sir Norman Duke, and Messrs. N. Elliott, C. R. King and L. Howles. We reproduce a photograph of the members of the Authority taken since the alteration. Alderman Sir William Walker, a part-time member, was unable to be present on the occasion.

Mr. E. H. Maltby has been appointed sales manager of the Sloan Electrical Co., Ltd., as from 1st February, and **Mr. F. French** has been appointed assistant sales manager. Mr. Maltby has been with the



Mr. E. H. Maltby

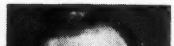
Mr. F. French

A recent Photograph of Members of the British Electricity Authority

Back Row (left to right): Mr. L. Howles (chairman, South Wales Board); Mr. C. R. King (chairman, East Midlands Board); Dame Caroline Haslett (part-time member); Sir Norman Duke (chairman, South East Scotland Board); Mr. Norman Elliott (chairman, South Eastern Board). *Front Row* (left to right): Lt. Col. E. H. E. Woodward (part-time member); Sir Henry Self (deputy chairman); Lord Citrine (chairman); Sir John Hacking (deputy chairman); Mr. E. W. Bussey (full-time member); Rt. Hon. T. Johnston (chairman, N. of Scotland Hydro-Electric Board).

company for sixteen years and has been engaged in London as an outdoor sales engineer. Mr. French has had twenty-four years' service with the company and until recently was manager of its Wiring Accessories Department. Both these gentlemen will be located at the company's Central London stores, 31-33, Bondway, Vauxhall, S.W.8.

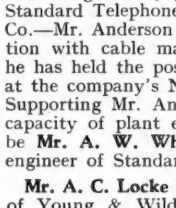
Following the recent signing of an agreement between the Government of India and Standard Telephones & Cables, Ltd., by which the latter act as technical advisers for the establishment of a factory in India for the manufacture of communication cables, the company announces the appointment of **Mr. L. E. Anderson,** A.M.I.Mech.E., to the position of cable consultant (India). During his career, which began in 1919 with the predecessor of Standard Telephones—the Western Electric Co.—Mr. Anderson has had a close association with cable manufacture. Since 1942 he has held the position of works manager at the company's North Woolwich factory. Supporting Mr. Anderson in India, in the capacity of plant engineering adviser, will be **Mr. A. W. White,** headquarters plant engineer of Standard Telephones & Cables.



Mr. L E. Anderson

Mr. A. C. Locke has joined the sales staff of Young & Wildsmith, Ltd., 35, Little Russell Street, New Oxford Street, W.C.1.

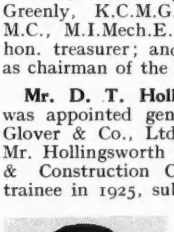
Mr. A. J. Bailey, who has retired from the post of works manager to Cooke & Ferguson, Ltd., Openshaw, Manchester, has been engaged in the electrical engineering industry in Manchester for the past twenty-two years. Mr. Bailey served his apprenticeship with the Westinghouse Co., Trafford Park, and was with B. & S. Massey from 1919 to 1923. In 1924 he joined the Igranic Electric Co., Ltd., Bedford, as assistant works manager, and returned to Manchester in 1928, joining Ferguson Pailin, Openshaw, with whom he was works manager until 1941, when he transferred to Metropolitan Vickers. After the war, Mr. Bailey joined Cooke & Ferguson, Ltd., and was responsible for the laying out of their production unit. At a dinner in Mr. Bailey's honour, Mr. S. Ferguson presented him with a television set from the works and staff.



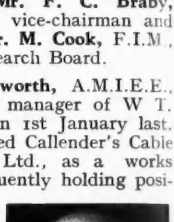
Mr. A. J. Bailey

The British Non-Ferrous Metals Research Association announces the election of the following new officers: **Lieut.-Col. the Hon. R. M. Preston,** D.S.O., as chairman of Council, succeeding Lieut.-Col. Sir John Greenly, K.C.M.G.; **Mr. F. C. Braby,** M.C., M.I.Mech.E., as vice-chairman and hon. treasurer; and **Dr. M. Cook,** F.I.M., as chairman of the Research Board.

Mr. D. T. Hollingsworth, A.M.I.E.E., was appointed general manager of W. T. Glover & Co., Ltd., on 1st January last. Mr. Hollingsworth joined Callender's Cable & Construction Co., Ltd., as a works trainee in 1925, subsequently holding positions in various departments of the company and before his appointment as general manager of W. T. Glover & Co. was research (power cables) manager of British Insulated Callender's Cables, Ltd.



Mr. D. T. Hollingsworth



Mr. J. W. Porter

Mr. J. W. Porter has been appointed assistant general manager of Glovers. Mr. Porter joined the Estimating and Order Departments of the company in 1910, and served in the Royal Navy in the 1914-18 war. He was appointed London representative in 1924, subsequently becoming the joint sales manager of the company in 1946.

The Railway Executive announces that with the concurrence of the British Transport Commission **Mr. J. F. Harrison,** assistant chief mechanical engineer, Eastern and North Eastern Regions, Doncaster, has been appointed mechanical and electrical engineer, Eastern and North Eastern Regions, Doncaster. This appointment is in accordance with the organization for mechanical and electrical engineering which is being standardized throughout British Railways; the work hitherto covered by the departments of the chief mechanical engineer and the electrical engineer in the

Eastern and North Eastern Regions is now being reorganized under the mechanical and electrical engineer (Mr. Harrison), the carriage and wagon engineer (Mr. A. E. Robson) and the road motor engineer (Mr. W. Guy Jones). The new organization will be implemented in stages.

Mr. F. Duckham has been appointed Midland branch manager of Berry's Electric, Ltd. Mr. Duckham served an apprenticeship in Wolverhampton, and later became associated with the electrical wholesale industry in the North Midlands area. During the last war and the immediate post-war years he was attached to the Royal Engineers' Service Branch of the War Department as supervising electrical and mechanical engineer. He joined the staff of Berry's Electric as West Midlands area representative in January, 1949. **Mr. L. B. Powell** becomes West Midlands representative, his territory embracing the areas covered by the Midlands and the South Wales Electricity Boards. Mr. Powell served a short works apprenticeship with George Ellison, Ltd., and was later with the Sutton Coldfield electricity undertaking and Chamberlain & Hookham, Ltd., joining Berry's Electric in May, 1947.

Mr. F. Duckham

Mrs. M. Alcorn, demonstrator at the Eccles (Lancs) Service Centre, will represent the North Western Electricity Board in the finals of the E.D.A. Public Speaking Competition.

Mr. F. Yeo-Thomas has been appointed the representative in Paris of the Federation of British Industries. He took up his duties on Monday last.

Mr. P. C. Blenkarne, managing director of P. C. Blenkarne, Ltd., Auckland, New Zealand, is visiting this country and expects to arrive toward the end of March. Mr. Blenkarne, who is interested in cinematograph and electrical equipment, wiring accessories, small hand tools and building materials, wishes to meet manufacturers of these items. While he is in England, Mr. Blenkarne's address will be c/o The Bank of Australasia, 4, Threadneedle Street, London, E.C.2.

At the annual party arranged by the Social Club of **Duratube & Wire, Ltd.,** Feltham, on 28th January, 120 children were present. The party was attended by Mr. C. Odescalchi (managing director), Mr. J. W. Tydeman (general manager), Mr. R. D. Smith (sales manager) and a number of other members and friends of the company.

Many retired employees of the **British Thomson-Houston Co., Ltd.,** Willesden, joined over 500 members and friends who attended the fourth annual reunion of the Long-Service Association at Wembley Town Hall on the 2nd February. Membership of this Association, which now stands at 330, is extended to those who have completed either twenty years' continuous or thirty years' broken service with the company. During the evening, Mr. L. Drucquer, switchgear sales manager and chairman of the Association, welcomed Mr. E. H. Ball, managing director of the B.T.H. Co., who presented certificates to twenty-eight qualifying members.

Following this, Mr. H. E. Cox, manager of the Willesden works and president of the Association, presented Mr. Ball with a Willesden long-service certificate. The M.C. for the dancing during the evening was Mr. W. A. Forster; there was also a cabaret entertainment.

Mr. E. S. Chisholm has been appointed manager of the Water Heating Sales Department of the Simplex Electric Co., Ltd., with effect from the 1st February. Mr. Chisholm has been connected with the electricity supply industry for over twenty years. He received his early training with the G.E.C. at its experimental test room at Wembley and later was with the Northmet Power Co. before joining the Eastern Electricity Board as district commercial officer in the Chilterns Sub-Area. During the last war he served in the Technical Branch of the R.A.F. Mr. Chisholm has contributed a number of articles to the technical Press on water heating matters.

Mr. E. S. Chisholm

For the time being he will be at Oldbury, Birmingham, but at a later date he will operate from the Simplex factory at Blythe Bridge, near Stoke-on-Trent.

On 27th January the **Telcon Staff Association** held its second annual dinner and dance at Pyne's Restaurant, New Cross, about 200 members and friends attending. Mr. F. Leighton, chairman of the Staff Association and works manager, proposed the toast to the Telegraph Construction & Maintenance Co., Ltd., and Lord Colgrain,

chairman of the company, in his reply stressed the need for the utmost co-operation in these days of increasing competition. Mr. J. N. Dean, managing director, proposed the toast of the Association, and Dr. G. A. V. Sowter replied. Other directors present were Messrs. B. H. Musgrave and W. F. Randall, and Dr. E. W. Smith (Submarine Cables, Ltd.).

Mr. L. Bomford, B.Sc., A.M.I.E.E., an Admiralty civilian engineering officer, has transferred to the Royal Navy with the rank of commander (L), and joined H.M.S. *Collingwood* on 29th January. He joined the Electrical Engineering Department of the Admiralty in 1936 and in May, 1944, served in the Pacific with the temporary rank of captain (L). He returned to this country in 1946 and took up the position of Admiralty regional electrical engineer.

OBITUARY

Col. Sir Thomas Purves.—A memorial service for the late Colonel Sir Thomas Fortune Purves, O.B.E., has been arranged by the Institution of Electrical Engineers, of which he was a past president and honorary member, in co-operation with the Cable Makers' Association, of which he was director for the last few years of his career. This service will be held at the King's Chapel of the Savoy, Savoy Street, W.C.2, on Wednesday next, at 2.30 p.m., and will be conducted by Prebendary W. L. Cottrell of that Chapel.

Mr. A. H. Meysey-Thompson.—The death occurred on 5th February, at the age of ninety-seven, of Mr. Arthur Herbert Meysey-Thompson, M.Inst.C.E., J.P., one of the founders of the Yorkshire Electric Power Co., and formerly vice-chairman of the company.

Mr. R. F. Mayer.—The death occurred on 5th February of Mr. Robert F. Mayer, who had been closely associated for the past twelve years with Thorn Electrical Industries, Ltd. He was largely concerned with the administration of the Lamp Sales Department and for many years was in charge of export development. He was a director of Lamp Presscaps, Ltd.

Mr. H. G. Dennes.—The death is reported of Mr. Howard Gay Dennes, A.M.I.E.E., which occurred in Barcelona on 1st February. Mr. Dennes was associated with the Riegos y Fuerza del Ebro S.A.

PUBLIC LIGHTING NOTES

LIVERPOOL Lighting Committee has asked the Electricity Consultative Council, Merseyside and North Wales Area, to receive a deputation with reference to the recent increase in the charges for electrial energy for street lighting purposes. The town clerk, the city treasurer and the city lighting engineer have been requested to prepare a case for submission to the Consultative Council.

Revised tariffs of the South Wales Electricity Board for street lighting are one of the main items in the increased estimate of expenditure for 1950-51 just approved by Swansea Corporation Highways Committee. The borough engineer, Mr. Robert Hudson, told the Committee that the Department had overspent £3,646 in the current year; £1,000 of this was the cost of operating full lighting. The new tariffs of the Electricity Board would cost £1,700.

Street lighting in Southwell, Notts, is to be changed from gas to electricity. This was unanimously resolved by the Parish Council on 16th January. The East Midland Gas Board's present charge of £415 is stated to compare with the Electricity Board's agreement to light and maintain 99 lamps for approximately £297 per annum.

Pinxton Parish Council is considering replacing the present gas lighting in the parish by electricity. Cost of installation would be £450 and the annual charge for maintenance and lighting is estimated to be £135.

Dagenham Borough Council reports that the Ministry of Transport has now given approval in principle to the second stage of the programme for improving the lighting of major roads in the borough.

At Bolton it is proposed to apply for sanction to borrow £11,915 to cover the cost of improved lighting on various main roads and bus routes in the borough during the year 1950-51.

INFORMATION DEPARTMENT

The extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

M.A.K. electric clocks.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Enquiries should be accompanied by a stamped addressed envelope.

Commerce and Industry

Engineering Wages Claim
Electricity in Farm Exhibition

LAST week the Engineering & Allied Employers' Federation rejected the claim of the Confederation of Shipbuilding and Engineering Unions for an increase of £1 a week for adult members of the unions with proportionate increases for young workers. The Confederation claimed that the engineering industry was quite capable of meeting the demand from profits; it would not be necessary to raise prices.

In its reply the Employers' Federation contended that this was fallacious as the Confederation had taken no account of the need for adequate provision for the depreciation and maintenance of plant or of a number of heavy overhead charges. It was pointed out that while wages had risen by 105 per cent between 1938 and 1948 dividends and interest (before deduction of tax) had increased by only 44 per cent. Reference was made to the resurgence of German and Japanese competition which would be dangerous if encouraged by higher British costs.

The executive committee of the Confederation is to meet at York on 14th February to discuss the next move in the matter.

Electrical Employment Statistics

Figures published in the January *Ministry of Labour Gazette* show that there were 736,600 persons employed in the electrical manufacturing, contracting and electricity supply industries in November last as compared with 733,100 in October. At 5th December there were 4,544 persons registered as unemployed in the electrical manufacturing industry (4,677 on 14th November); in electrical contracting 1,073 (1,162); and in electricity supply 883 (894).

E.D.A. Area Reorganization

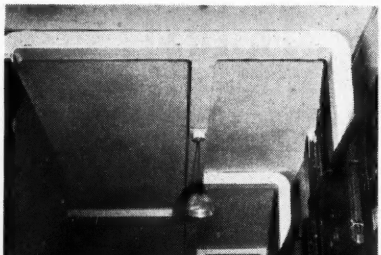
As a result of certain changes which are being made in the organization of the British Electrical Development Association, the Manchester office at 1, Dickinson Street West, has been closed. The functions of the North Western-Merseyside & North Wales Joint Committee will in future be carried out independently in the areas of the two Electricity Boards. The Association's advisory service will be maintained. Communications should be sent to the appropriate address below, or to Mr. V. W. Dale, general manager and secretary, the British Electrical Development Association, 2, Savoy Hill, London, W.C.2:—North Western Area: E.D.A. liaison officer, Mr. A. O. Johnson, North Western Electricity Board, Cheetwood Road, Manchester, 8 (tel.: Deansgate 6671). Merseyside & North Wales Area: E.D.A. liaison officer, Mr. W. Gilchrist, Merseyside & North Wales Electricity Board, Electricity House, Love Lane, Liverpool, 3 (tel.: North 2681).

Lighting Fittings Showroom

Philament Electric, Ltd., was formed in 1946 to manufacture electric lighting fittings and an ordnance factory was taken over on the trading estate at Bridgend, Glam., a Welsh development area. The industry was new to the area, and the men, many of them previously engaged in the mining industry, had to be trained for this specialized work. From small beginnings the company has grown and now not only supplies to the home market but also does a considerable amount of export business.

The company has now opened a London

Part of the new London lighting fittings showroom opened by Philament Electric, Ltd.



Portion of Channel Conduit installation at the Amalgamated Press offices, London, E.C.4

showroom at 12, Westminster Bridge Road, St. George's Circus, S.E.1. These have been entirely redecorated, and within the limits of the space available, a well-arranged and representative selection of lighting fittings is on show. These include modern and period fittings, each separately wired for demonstration purposes. There is also a section showing fittings for industrial and commercial premises. In addition to the new showrooms, the company has a warehouse at Lewisham where comprehensive stocks are held. The new premises are in charge of Mr. B. Cadman, the company's sales manager.

Electrical Commercial Travellers

The Electrical Trades' Commercial Travellers' Association is holding its annual luncheon on Friday next at the Connaught Rooms, Great Queen Street, London, W.C.2. Tickets (15s each) can be obtained from Mr. H. Bowen, entertainments secretary, 69, Warwick Gardens, London, W.14.

Housecraft Advisers' Conference

The fifth post-war conference of electrical housecraft advisers, senior demonstrators and senior showroom assistants, organized jointly by the Electrical Association for Women and the British Electrical Development Association, will be held from 28th to 31st March. The first three days' proceedings will be held in the Cowdray Hall, Henrietta Place, Oxford Street, London, W.1, and the meetings on the last day at the Connaught Rooms, London. The conference will be opened by Sir Henry Self (deputy chairman, British Electricity Authority), and in addition to a number of papers covering electrical housecraft, there will be a visit to the Ideal Home Exhibition at Olympia, and the showing of E.D.A. films. The conference will conclude with a luncheon at the Connaught Rooms.

Surface Wiring Installation

The convenience of the Channel Conduit system for the rewiring of buildings is well demonstrated by an installation just being completed by Burdette & Co., Ltd., at the Amalgamated Press offices at Fleetway House, Farringdon Street, London, E.C.4. Between 400ft and 500ft of the rectangular section conduit, which is the modern equivalent of the old wooden capping and casing, have been employed in various sizes from 1in by ½in up to 4in by 3in.

The conduit, which is made of sherardized steel, is supplied in 12ft lengths, easily cut and mitred, where the comprehensive range of standard Channel Conduit accessories might not be suitable. Fixing is by means of countersunk screws every 2ft, no cutting away of the walls being necessary. Access to the wiring for inspection, alterations or additions is instantly available by the removal of capping, which is held in position by its spring grip. Lights can be fixed direct on to the conduit. The conduit system is manufactured by Channel Conduits, Ltd., 11, Victoria Street, London, S.W.1.

Pakistan Tariff Commission

The United Kingdom Trade Commissioner in Karachi has reported by telegram that the Pakistan Government has announced the setting up of a Tariff Commission to consider and recommend the forms of assistance (not necessarily tariffs) required to protect local industry and to advise the Government generally on methods of fostering local industry and securing local production at the most economical cost. The chairman is to be Dr. Nazir Ahmed, joint secretary, Ministry of Financial and Economic Affairs, with Syed Moazzemuddin Hossain, a director of the Pakistan Industrial Finance Corporation, as a member, and a secretary yet to be appointed. The Commission will make recommendations regarding the rate of protective duty to be imposed; other assistance to be given to the industries by the Government; and duration of protective duty or other assistance.

Paris Trade Fair

During the second week of the Foire de Paris, a Franco-British Day will be held. British business men attending the Fair will

that day be the guests of the organizers at a banquet. A delegate of the Fair has already visited Birmingham and Manchester and other towns to invite business men to visit the Fair in groups. A special programme for visitors and their wives has been drawn up covering hotel, social events and the services of an English-speaking courier and guide. Franco-British day will be 25th or 26th May. Those wishing to take part should write to the Foire de Paris, 23, rue Notre Dame des Victoires, Paris (2e).

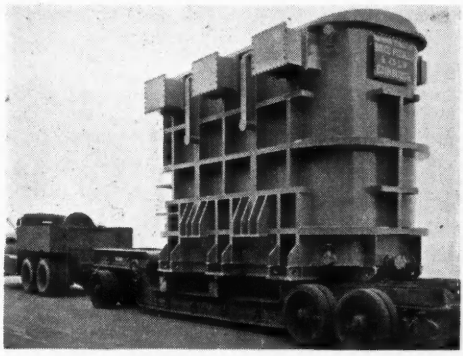
Speedy Delivery

An urgent order for a controlled electric clock system for the Alexandria Sporting Club was received by Gent & Co., Ltd., by cable on 3rd January with a special request that the equipment should be delivered in good time for installation before the opening of the racing season by King Farouk on 15th February. The equipment was dispatched by B.O.A.C. flying boat at Southampton in good time for the racing season. The company reports good business with Egypt, particularly in clocks and clock systems, recent orders including equipment for the National Bank of Egypt, Egyptian State Railways, Ministry of Public Works, Cairo, the Sebahi Spinning Co. and (in the face of keen American competition) the Coca-Cola factory in Alexandria.

Transformer for Portobello

The first of two 75,000 kVA generator transformers recently left the works of Bruce Peebles & Co., Ltd., by road for the Portobello power station. The transport of this big transformer created wide interest and the B.B.C. broadcast a talk covering the operations. Among the factors governing the design of the transformers was the need for adequate cooling in a restricted space below ground level. Duplicate 100 per cent forced oil cooling is used; each pump is capable of dealing with the full-load cooling requirements by forcing oil through one or other of the Serck coolers.

The accompanying picture shows the transformer, weighing 100 tons when stripped for transport, leaving Bruce Peebles' works by road for the power station. The total weight of the complete unit, including its 7,000 gallons of oil, coolers and oil conservator, is 130 tons. Two 200 h.p. diesel-tractors provided the motive power for the 25-ton trailer carrying the transformer, and the whole haulage unit measured over 100ft and weighed 200 tons. The distance from the works to the power station is about four miles, but the load was too large for some of the bridges on the direct route and a wide detour had to be made.



A 75 MVA transformer leaving the works of Bruce Peebles & Co., Ltd. en route to Portobello Power station

Welding Exhibition for Glasgow

The British Welding Research Association exhibition "Research and Production," which is being staged at the London headquarters of the Association (7th to 11th February) will be sent to Glasgow and opened at the Engineering Centre, 351, Sauchiehall Street, Glasgow, on 20th February and continue until the 24th. The exhibition will be open each evening while in Glasgow so that as many craftsmen as possible may have the opportunity of studying modern practice.

Television Camera Order

The B.B.C. has placed an order for five Image Orthicon cameras with Marconi's Wireless Telegraph Co., Ltd. This camera is a compact unit built in two parts—the camera and the electronic view-finder—which clip together when set up for operation. In the lower unit is the Image Orthicon pick-up tube, the vision preamplifier circuit, and the focusing controls. The smaller unit, the one on the top, is the view-finder, containing a miniature television receiver which receives the picture which is being transmitted from the control desk. In this manner the camera operator sees the picture his camera is picking up and can therefore adjust his camera controls accordingly.

Because of the small size of the Image Orthicon tube it is possible to use standard camera lenses. Focusing is accomplished by rotating a small knob at the side of

Part of the electrical exhibit at the Hitchin farm buildings conference

the camera. This racks the Image Orthicon backwards and forwards and eliminates any movement or adjustment of the lenses. A multi-core cable of only ⅞in diameter is all that is necessary to link the Marconi camera to the control equipment, and this cable can be up to 1,000yd in length.

New Zealand Telephone Contract

The Department of Posts and Telegraphs of New Zealand has placed a contract with Standard Telephones and Cables, Ltd., for the complete re-equipment of the two 40 naut. m. submarine telephone cables which link the North and South Islands. The first of these was laid in 1937 and the second was completed in 1945. The two submarine cables provided together 35 carrier-derived and two voice-frequency circuits.

The new equipment to be supplied will operate up to a frequency of 300 kc/s on each cable, providing in each cable 32 carrier telephone channels, one voice frequency telephone channel, and, what was not previously available in this system, a musical channel.

Also included in the contract are 12 twelve-channel open-wire carrier telephone systems which will be used to extend the new circuits provided by the cables to many places in the North and South Islands. Of those in the South Island, one music channel is provided on each route served by the twelve-channel systems.

Zinc Prices Reduced

The Ministry of Supply announces that from 25th January last the price of good ordinary brand zinc has been reduced by £2 to £85 10s per ton delivered. Prices of other grades are reduced accordingly.

The Zinc Oxide Manufacturers also announce that from the same date the prices of zinc oxide in lots of not less than two tons delivered at buyers' premises have been reduced by £1 15s as follows: Red seal, £82 5s; green seal, £83 15s; white seal, £84 15s.

Electricity and Grain Storage

Under the auspices of the Hertfordshire Agricultural Executive Committee and of the Ministry of Agriculture and Fisheries, a conference on farm buildings was held at Hitchin recently and was attended by about 400 agriculturists, some of whom came from as far away as Scotland. The afternoon session was devoted to the subject of "Corn Storage on the Farm," and in connection with it an exhibition of models, photographs and leaflets illustrating the use of electricity was staged by the Eastern Electricity Board and the British Electrical Development Association.

The exhibits were arranged in the auditorium, on either side of the stage facing the audience, and consisted of models of barn hay drying (Electrical Research Association), continuous grain dryer with storage bins (Aldersley Engineering Co.), automatic hammer mill installation (Electrical Development Association), ventilated bin grain storage (Eastern Electricity Board), and wiring display boards (by Pyrotenax Cables, Walsall Conduits and B.I. Callender's Cables).

The setting up of the exhibition was carried out by the staff of the Letchworth district of the Eastern Electricity Board, who also arranged an attractive window display in the Board's Hitchin showroom.

Dutch Visitors to the G.E.C.

Officials of Dutch electricity supply companies recently spent two days as guests of the General Electric Co., Ltd. They included Mr. Snellen, director of P.E.N. (North Holland Supply Co.); Mr. Van de Toolen, also of P.E.N.; Mr. de Groof, P.N.E.M. (North Brabant Supply Co.); Mr. Brons, P.N.E.M. (Utrecht Supply Co.); and Mr. Harpman, P.L.E.M. (Limburg Supply Co.). They were accompanied by Mr. B. P. Verel, Dutch agent of the G.E.C., and Mr. Van der Water, responsible for the import of G.E.C. refrigerator exports

Officials of Dutch electricity supply companies at the G.E.C. research laboratories

to Holland. Highlights of an interesting programme arranged for them included tours of the Coldair refrigerator factory and the G.E.C. research laboratories, Wembley, where they saw diamond drilling, applications of process heating and the 12ft sphere photometer, second largest in the world and the only one in Great Britain. Visits to the Connaught Rooms to inspect G.E.C. cooking equipment, to Ring & Brymer to view the baking equipment installed by the G.E.C. there, and to the Hotel and Catering Exhibition at Olympia also aroused great interest.

National Radio Exhibition

The radio and television exhibition, which, as already announced, is to be held at Castle Bromwich, Birmingham, from 6th to 16th September next, is to be the 17th National Radio Exhibition. All previous National Radio Exhibitions have been held in London. The Exhibition Organizing Committee, under the chairmanship of Mr. F. W. Perks, is substantially the same as that which organized the last two National Radio Exhibitions at Olympia.

B.T.H. Activities

The summary of manufacturers' activities in our issue of 20th January contained a statement that ". . . a single-cylinder 30 MW machine for the B.E.A. is designed for 600 lb/sq in and 850 deg F exhausting to a vacuum of 28.4in . . . ," which is not correct. This turbine is not for the B.E.A. which, it is understood, has not ordered any single-cylinder 30 MW machines. Also the 100 MW machine described by the makers as of three-cylinder design is, in fact, a two-cylinder set.

Trade Announcements

Newman Industries, Ltd., announces that to meet the requirements of the North American market, it has now in production a complete range of electric motors designed to N.E.M.A. dimensions, which will have Canadian Standards approval. Mr. C. W. Linger is to take charge of export sales development.

Measurement, Ltd., announces that as from the beginning of this year, a reorganization of its representation has taken place, and that in regard to the East Midland Board Area, Mr. R. M. W. Kullman, M.B.E., will act vice Mr. C. W. Clark. Mr. H. Horwood, A.M.I.E.E., who is the company's technical sales engineer for telemetering and "Actadis" ripple control equipment, has, in addition to these duties, been appointed an area sales manager for electricity meters.

Refrigerator Conference

A conference of the main distributors concerned with the English Electric Co.'s 6.4 cu ft refrigerator was held on 1st February at the Palace Hotel, Southport, when Mr. H. G. Nelson, deputy managing director of the English Electric Co., welcomed the visitors. Other English Electric officials present were Mr. J. A. Fraser (sales manager, Domestic Appliance Department) and Mr. J. Collins (divisional commercial manager, Liverpool Works). The delegates inspected the refrigerator factory, and, later, material associated with the company's advertising and publicity plans for 1950 was described by Mr. J. Taffs and Mr. S. Horniblow. At dinner in the evening, Mr. P. Davies, of Downes & Davies, Ltd., voiced the thanks of the guests. The response to the toast of the guests was made by Mr. J. W. E. Rutherford, president, Electrical Wholesalers' Federation.

Catalogues and Lists

Elkay Electrical Mfg. Co., Ltd., 4, Southampton Row, London, W.C.1.—Priced leaflet on "Columbus" automatic time delay switches for staircase lighting, etc.

Communication Systems, Ltd., Strowger Works, Liverpool, 7.—Technical brochure on "Strowger" 25-line private automatic telephone exchange equipment.

Thermega, Ltd., 51-53, Victoria Street, London, S.W.1.—Revised price list of "Thermega" heating pads and blankets.

The D.P. Battery Co., Ltd., 50, Grosvenor Gardens, London, S.W.1.—Technical brochure on D.P. "Kathanode" batteries.

AREA BOARDS' REPORTS

Review of Activities in 1948-49

SUMMARIES of the first annual reports of ten of the Area Electricity Boards have already appeared in these pages; this week the remaining four are dealt with.

NORTH EASTERN

Being by no means self-sufficient in generating plant the Area has to import, at times heavily, from adjacent Areas. As there are only two 132 kV main transmission lines the loss of one of these, or a major item of plant, gives rise to serious conditions. Thus it is that the Area has suffered more than others in the way of supply interruptions.

Considerable reinforcement and extension works have been carried out during the year on the 66 and 20 kV systems. Other major construction activities have included a new 33 kV point of supply at Melrosegate, York, and h.v. switchgear improvement at Sunderland.

Industrial consumers are predominant. Colliery requirements, for example, accounted for 27 per cent of the Board's total sales. In the shipyards the tonnage of vessels launched declined slightly; nevertheless electricity consumption in shipbuilding rose by 14 per cent, demonstrating its wider use. Iron and steel works took 4 per cent more. Negotiations were completed for new and increased industrial supplies aggregating 39,000 b.h.p., representing an annual consumption approaching 40 million kWh.

Actual connections of consumers' plant during the year amounted to 22,500 b.h.p., including three arc-melting furnaces totalling 5,000 kW.

Commercial and domestic supplies (28 per cent of the total) increased by 15 per cent, housing development resulting in the connection of 25,685 houses during the year. In the rural areas 946 of the 1,209 villages and hamlets having ten or more inhabitants are now receiving a supply; 33 were given service during the year and work was in progress to supply 36 others. Of the 13,961 farms 3,831 are served, 310 being connected during the year.

In other spheres, supplies for traction purposes increased by 6 per cent and 2,660 public lamps were added, making the total number 38,794.

Hire schemes (mainly for cookers) had been reintroduced after the war by three of the undertakings vested in the Board. It is not intended to extend these at present or to introduce further facilities of the kind.

Consumers at 31st March, 1949, numbered 701,893, an increase of 28,031.

NORTH WESTERN

The total sales during the year averaged 3,420 kWh per consumer, or 987 kWh per head of the population. Main avenues of development have been rural supplies, housing schemes and conversion of textile mills. Over 750 farms were connected, making the total well over 10,000. An interim policy was introduced under which farmers are no longer required to make a capital contribution provided a reasonable revenue is guaranteed. Cumbersome procedure and the multiplicity of departments, councils and associations which have to be consulted are stated to have greatly delayed extension

TABLE I
Area Boards' Financial Results

Board	Trading Revenue*			Other Income†	Interest, etc., Charges‡	Net Revenue	Transfers to Central and Area Reserves	Balance Carried Forward
	Sale of Electricity	Meter and App. Rentals	Surplus on Contracting and Sales of Fittings					
	£	£	£	£	£	£	£	£
North Eastern	10,795,917	123,923	71,970	34,746	445,026	259,614	165,000	94,614
North Western	20,294,529	261,430	80,399	35,989	861,004	393,081	269,000	124,081
South East Scotland ...	4,075,900	23,267	3,896	13,008	157,388	408,888	343,000	65,888
South West Scotland ...	9,592,216	32,561	49,444	18,972	281,884	378,606	299,000	79,606

* Revenue from the "Clow Di ferential" surcharge is excluded, being credited to suspense account. † Rents receiva other miscellaneous income and interest on hire-purchase and similar sales. ‡ Interest on consumers' deposits and B.E charges in respect of interest and financing; no provision for income tax or profits tax was required.

work. Also, when schemes have been formulated they are sometimes held up by the disinclination of a minority of residents to give their support. The Board is confident, however, that the problems can be solved and a more rapid programme of development embarked upon.

At 31st March, 1949, there were 213,800 cookers connected to the Board's mains, an increase of 17,386 during the year. In the same period the number of wash-boilers rose by 7,736 to 77,691, immersion heaters by 10,958 to 114,431 and self-contained water heaters by 1,954 to 31,820.

On the engineering side, the report says it is not always realized that after the war the transmission and distribution systems of electricity undertakings were, like the generating stations, very short of capacity. At the outset the Board faced a major planning problem which for urgency and magnitude is not likely to be equalled in the future. In the first year nine major schemes were planned and agreed with the Central Authority involving capital expenditure of the order of £1,500,000.

The first year saw the gradual introduction of a fully documented uniform purchasing scheme under which Sub-Area staffs enjoy a wide preference in their buying.

SOUTH EAST SCOTLAND

A review of load distribution in relation to the relatively widely spaced bulk supply points indicated the need for a 33 kV network in each Sub-Area fed from these points. The application of this policy to the Central Sub-Area will result in the eventual elimination of the extensive 22 kV system covering most of the area of the former Scottish Central Power Co. The standard voltage of 11 kV will be adopted for all new networks distributing supplies from substations on the 33 kV system.

It was decided to reduce the declared voltage of all a.c. 440/250 V to the standard 416/240; the change, affecting 115,853 consumers, was carried out smoothly and at negligible cost.

Apart from making up leeway, developments, particularly in the coal fields, will necessitate several major extensions to the distribution system. Among the most important is a new supply of 12,500 kW at Thornton in Fife which will be taken from a new substation at Redhouse. Arrangements are in hand to afford supplies aggregating 9,500 kW for a group of collieries south of Dalkeith.

In the rural areas 240 out of some 350 villages of ten or more premises are already supplied. Plans to accelerate development have been examined and a large number of schemes have been put in hand.

Details of number of consumers show that there was a net addition of 18,068 during the year, making 297,020.

SOUTH WEST SCOTLAND

A preliminary study of the maximum demands on the networks and the anticipated growth of load revealed an urgent need for the establishment of a higher voltage transmission system. As a first step it was decided that where reinforcement was required it should be carried out at 33 kV. Plans for such works were approved amounting to £2,695,930 (Glagow Sub-Area, £821,000; Lanarkshire £497,500; Ayrshire £1,200,000; Dumfries and Galloway, £177,430). Complementary additions to the main transmission lines of the Central Authority may cost in the region of £2,000,000. As these schemes are the foundation of future developments their completion is a matter of urgency and it is hoped that they will be finished by the winter of 1951-52.

Of the 658,742 consumers at 31st March last 25,316 were connected during the year.

TABLE II
Sales of Electricity in Million kWh and Price Received per kWh Sold

Board	Flat Rates: Lighting		Flat Rates: Heating etc.*		Two-Part Tariffs: Domestic		Two-Part Tariffs: Commercial		Farming Tariffs		Large Power		Public Lighting		Traction		Total†	
	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.	Mill. kWh	Price d.
(1)	115.1	3.08	124.2	1.03	415.3	1.13	116.4	.56	8.0	1.14	1,728.3	0.79	10.7	1.62	75.0	0.87	2,593.0	1.00
(2)	177.4	3.56	331.6	1.20	1,311.2	1.03	162.8	.65	34.4	1.07	2,329.0	0.89	30.0	1.27	69.1	0.87	4,445.5	1.09
(3)	31.9	3.45	69.7	1.34	261.6	1.11	59.0	1.43	8.2	1.40	349.1	0.98	9.1	1.21	35.9	0.93	824.5	1.19
(4)	14.5	2.97	31.5	1.35	725.4	1.94	309.0	1.28	10.8	1.19	1,181.2	0.94	21.6	0.92	0.2	4.90	2,294.4	1.00

* Including cooking, water heating and small power. † Excluding inter-Board sales.

At vesting date 24,103 consumers were receiving d.c. supplies and it is estimated that the change-over to a.c. will involve new capital works amounting to £700,000, apart from the cost of changing consumers' apparatus. During the year supplies to 2,000 consumers were converted.

Of the 468 villages in the Area 70 are without a supply. There are also about 5,000 farms still to be supplied in addition to the 4,181 already served (of which 275 were connected during the year). Programmes are being prepared for the development of other parts of the Area.

In all, with routine system extensions, the Board's capital expenditure is expected to be well over £2,000,000 annually for many years to come.

Popular Versions of Reports

The British Electricity Authority and Electricity Boards are endeavouring to acquaint their staffs and the general public of their work, and for this purpose have produced, or are producing, various publications of a popular character.

First of these is "Power Pictorial," issued by the B.E.A. itself. This is an eight-page, small-format newspaper, headlined and illustrated in the accepted style. It is intended primarily for the staffs of the Authorities and Boards, and deals with the annual reports in a succinct, chatty way. There is a message from Lord Citrine, in which he speaks of the first year's achievements and his hopes for the future of the organization. Many aspects of the electricity supply industry, with emphasis on the personal aspect, are dealt with.

From the London Board we have received "London Electricity," also comprising eight pages, much of which is pictorial. It deals in a popular way with the Board's personnel and activities during its first year. The pictures showing the dependence of London on electricity are particularly good.

There appeared in all the daily papers in the South-Western Area on 20th January a large displayed advertisement by the South-Western Electricity Board. This followed the lines of the customary directors' report to shareholders, stressing the fact that the Board was a commercial enterprise with wide responsibilities for public service. Dealing with the deficit of £106,487, the Board pointed out that the general position in the area was that all the undertakings combined made a surplus in 1947-48 of £210,000 before providing for interest, dividends and taxation. The comparable figure for the Board (1948-49) was a surplus of £294,500, before charging interest due to the B.E.A.

In addition to this the Board produced for its employees a four-page pamphlet (black and green), setting out, with diagrammatic illustrations, the salient features of the report and showing particularly the large rural proportion of the Area—described as the Board's biggest problem.

A folder by the Eastern Board was also attractively produced in black and green. In it were maps showing the division of the Area before and after 1st April, 1948. Notes on the new organization, and what it did during the first year, were included, and there was an interesting pictorial representation of the sources of income and items of expenditure. One page was devoted to the names of the members and officials of the Board including district managers.

WELDING ELECTRODES

WITH the increased applications of electric arc welding new types of electrodes have been evolved. One of the most important considerations when using arc welding is the selection of the correct type of electrode for each specification, and to assist users in this direction a new edition of "British Electrode Classification," covering manual arc welding electrodes for the welding of mild steels, has been prepared and issued by the Arc Welding Electrode Section of the B.E.A.M.A., in collaboration with the Institute of Welding.

In this 24-page booklet the most important characteristics of electrodes available are considered and electrodes for welding mild steel are classified under the following headings: Method of manufacture; type of flux covering; welding position in which the electrode can be used satisfactorily; welding current conditions recommended; and whether suitable for "deep penetration" welding. All electrodes classified under this system conform to BS.639-1935 Class A and it is only intended to cover electrodes of over 12 s.w.g. The text concerning classification has not been changed since the last edition, but the list of electrodes now being marketed has been amended.

This booklet is available at 1s from the British Electrical and Allied Manufacturers' Association, 30-38, Kingsway, W.C.2.

A.S.E.E. Annual Dinner

THE annual dinner and reunion of the Association of Supervising Electrical Engineers will be held on 21st April at the Connaught Rooms, Great Queen Street, London, W.C.2, when the president, Mr. A. G. Ramsey, will preside.

ELECTRICITY SUPPLY

Services in Pimlico Flats

Overhead Lines in Northumberland

ORIGINALLY it was intended that all 495 flats in Section 1 of the Westminster City Council's Pimlico estate should be wired for electric lighting and heating (additional to the central heating), but that only one-third (165 flats) should be wired for electric cookers, refrigerators and wash boilers, the remaining two-thirds (330 flats) being carcassed for gas equipment of this kind. The charge to be made by the North Thames Gas Board was to be £8 5s per flat, a total of £2,722.

The North Thames Gas Board has now offered to install the necessary gas services for cooking, refrigeration and laundry facilities in all flats in Section 1 at a charge of £4 7s per flat (total £2,153), though the previous charge will stand if only two-thirds of the flats are served with gas. The Electricity Board has also stated that it would be prepared to contribute a sum not exceeding £1,745 for wiring for cookers, etc., in the former gas-only flats in Section 1, provided that if the cost of installation exceeds £1,745 the Council will itself bear the extra cost.

The Housing Committee has directed that the offers should be accepted, as they present the Council with an opportunity, which may not recur, of carcassing and wiring all the flats in Section 1 at a cost which is not likely to exceed the total cost of the part-gas, part-electricity installations formerly intended, and of giving to all prospective tenants freedom of choice between gas and electricity for cooking, etc.

Overhead Line Policy

A report was recently submitted to the Northumberland County Council on the policy adopted by the Town Planning Committee regarding overhead lines. Complaint had been made that this policy was interfering with the provision of electricity to some areas owing to the expense.

It was stated that the Committee had tried to eliminate grounds for complaint, and of the 172 applications made in the past year by the Electricity Board 142 were approved without modification and 30 subject to agreed modification. The Committee had generally insisted on cables being underground in built-up urban areas and on new housing estates.

In country areas, efforts had been made to erect cables as unobtrusively as possible, and in villages they had been kept out of sight by placing them along the backs of houses. The provision of overhead systems of street lighting in rural areas was made difficult by placing supply lines behind houses, but it had been found that a satisfactory system could be arranged by bringing leads through between the houses to the lamp standards in the road and, in certain cases, by fixing lamps to buildings.

Power for Atomic Establishment

It is reported that the British Electricity Authority is investigating a site for a power station, with initially two 60 MW sets, within seven miles of Capenhurst, Ches, where the Ministry of Supply's new atomic energy establishment is to be set up. The power station would supply electricity to the atomic establishment.

Mill Tariffs

The Master Spinners' Federation has asked mill owners for details of local electricity tariffs with a view to the position of the cotton industry being represented to the British Electricity Authority.

Rationing in Rio

On 1st February a system of electricity rationing came into force in Rio de Janeiro. The measure is rendered necessary by the prolonged drought of the past year and the rapidly increasing consumption. These factors call for a reduction of the order of 370,000,000 kWh in consumption during 1950-51, or 10 per cent of the estimated normal amount. The Lages reservoir, with a capacity of 752,000,000 cu m of water, contained 430,000,000 cu m at 1st January, 1949, and only 148,000,000 cu m at the beginning of the present year. By the end of 1951 the Rio de Janeiro Tramway, Light and Power Co. hopes to have completed its new installations, on which work was suspended during part of last year pending the conclusion of negotiations for a loan.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

REPORTS AND DIVIDENDS

Bylock Electric, Ltd.—In his statement issued with the report and accounts, Mr. C. A. Mathes (chairman) says that the company's turnover has recovered to a point not very much below the years 1946 and 1947, during which trading conditions were vastly different from those of to-day. Wages and prices of materials have risen and it is feared that the devaluation of sterling will result in further increases, while at the same time it has been found impossible to increase selling prices. The liquid cash position of the company continues to be difficult and although profits were earned during the year it would be unwise to make any distribution by way of dividend.

International Combustion Africa, Ltd.—The annual meeting was held on 27th January in Johannesburg when Sir George Usher (chairman), who presided, said that the machine shop and foundry at Port Elizabeth had commenced operations. They had the distinction of being the first company capable of manufacturing heavy boiler plant and combustion equipment in Africa. The number of orders received since the last annual meeting had surpassed expectations and they had on their books at the present time orders amounting to nearly £4,000,000.

The Calcutta Electric Supply Corporation, Ltd.—Underwriting is being arranged for the new debenture stock issue of £3.000,000 which will be the subject of an offer for sale shortly by Lazard Brothers & Co. The terms provide for a 5 per cent stock at a price of 98 carrying redemption in 1970. Arrangements are also being made for a simultaneous issue on the same terms in India where Rs.266 lakhs of the stock, equivalent to approximately £2,000,000, is being underwritten by Place, Siddons & Gough, of Calcutta.

The Palestine Electric Corporation, Ltd., is holding an extraordinary meeting on 24th February to consider the proposal for the distribution to ordinary and "A" ordinary shareholders of a capital bonus of one new share for each six ordinary and/or "A" ordinary shares held.

The Manx Electric Railway Co., Ltd., reports an operating profit to 30th September last of £14,006, as compared with £22,402 in the preceding year. An ordinary dividend of 2 per cent is proposed.

NEW COMPANIES

Artic Fuse & Electrical Manufacturing Co. (Holdings), Ltd. — Registered 3rd February. Capital £50,000. To acquire the business of the Artic Fuse & Electrical Manufacturing Co., Ltd. Directors: F. A. Ross and J. Crawford. Regd. office: Elizabeth Avenue, Birtley, Co. Durham.

E.R. Appliance Manufacturing Co., Ltd.—Registered 26th January. Capital £10,000. To acquire the business of a repairer of vacuum cleaners, hair dryers and electrical appliances, carried on by D. G. Critchett as Electro-Reps, off High Road, Leytonstone, E.11. Directors: D. G. Critchett and Mrs. Doris M. Clark. Regd. office: 32, Victoria Street, S.W.1.

E. F. Electric, Ltd.—Registered 31st January. Capital £15,000. To acquire the business of manufacturers of and dealers in electrical goods of all kinds carried on by E. F. Electro, Ltd., at Willow Lane Factory, Watford. Directors: E. Frank and Florence E. Frank. Regd. office: 37, Norfolk Street, W.C.2.

Abbott & Timbrell, Ltd.—Registered 31st January. Capital £3,000. Electrical engineers and general electrical installation contractors, etc. Directors: L. B. Abbott, L. A. Timbrell and T. Fleming. Regd. office: 14, Sheep Street, Wellingborough.

Isotope Developments, Ltd.—Registered 2nd February. Capital £25,000. To develop and turn to account the use of radioactivity and the uses of radio-active and stable isotopes and radiations which are emitted or caused by them, etc. Subscribers: E. Belton and A. W. Mallinson. Solicitors: Slaughter & May, 18, Austin Friars, E.C.2.

Ivan Strudwick, Ltd.—Registered 10th January. Capital £2,000. Electrical, radio, television, lighting, telephone, mechanical, service and general engineers, etc. Directors: A. I. Strudwick, Christina M. Strudwick and L. C. Flock. Regd. office: 53, High St., Keynsham, Bristol.

Marshalsea Hatch, Ltd.—Registered 13th January. Capital £1,000. Electrical and mechanical engineers and contractors, etc. Directors: Mrs. Diana D. Parkhouse, C. H. Marshalsea, and G. H. Hatch. Regd. office: 1, Powerscourt Road, Portsmouth.

C. H. Whitfield & Co., Ltd.—Registered 19th January. Capital £2,000. To acquire the business of electrical engineers carried

o by C. N. Whitfield and T. W. Dodshon a Whitley Bay as C. N. Whitfield & Co. Directors: C. N. Whitfield, T. W. Dodshon and L. T. D. Heppell. Reg. office: 154, Whitley Road, Whitley Bay.

INCREASES OF CAPITAL

Axia Fans, Ltd.—Increased by £42,500, in £1 ordinary shares, beyond the registered capital of £7,500.

British Electric Traction Co., Ltd.—Increased by £1,581,504, in £1 "A" deferred ordinary shares, beyond the registered capital of £2,998,397 15s.

G. E. Wallis & Sons (Electrical), Ltd.—Increased by £10,000, in £1 ordinary shares, beyond the registered capital of £20,000.

Lionel Robinson & Co., Ltd.—Increased by £14,000, in £1 ordinary shares, beyond the registered capital of £11,000.

LIQUIDATIONS

Weldona Electrical Appliances, Ltd.—Winding up voluntarily. Liquidator, Mr. A. E. Orbell, 6 and 7, Old Steine, Brighton.

E.F. Electro, Ltd.—Winding up voluntarily. Liquidator, Mr. R. I. Skeet, 37, Norfolk Street, London, W.C.2. (See registration of E.F. Electric, Ltd., on previous page.)

Coils (Beeston), Ltd.—Winding up voluntarily. Liquidator, Mr. E. Winstanley, 13, St. Peter's Gate, Nottingham. Particulars of claims to the liquidator by 28th February.

Parker Radio Corporation, Ltd.—Voluntary liquidation. Meetings 6th March at the offices of A. C. Palmer & Co., Norfolk House, 7, Lawrence Pountney Hill, E.C.4, to receive an account of the winding-up by the liquidator, Mr. G. G. P. Goldney.

Sandown Radio Instruments, Ltd.—Voluntary liquidation. Meetings 6th March at 15, Deansgate, Blackpool, to receive an account of the winding-up by the liquidator, Mr. T. A. Gott.

BANKRUPTCIES

J. G. Sandell, 20, Hart Road, Dorking, Surrey, electrical contractor, and of Ansell Road, Dorking.—Application for discharge to be heard on 3rd March at the County Court, Scarbrook Road, Croydon.

W. M. Horsfall, carrying on business at 7, Redcross Street, Liverpool, electrical engineer.—Supplemental dividend of 11s 3¾d in the £, plus 4 per cent statutory interest, payable 17th February at the Official Receiver's Office, West Africa House, 25, Water Street, Liverpool, 2.

J. F. Draper, 15, Cumberland Road, Acton, W.3, lately carrying on business at 230, Horn Lane, Acton, W.3, electrician.—Last day for receiving proofs for dividend 14th February. Trustee, Mr. C. T. Newman, 3, Central Buildings, Westminster, S.W.1, Official Receiver.

TRADE MARKS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered within a month of 1st February:—

DELANIUM. No. 684,429. Class 7. Dynamo brushes made of carbon; and tubes made of carbon and being parts of industrial chemical machinery; all being goods for export.—Powell Duffryn Carbon Products, Ltd., Springfield Road, Hayes, Middx.

PHYSIONIC. No. 663,364. Class 9. Electrical apparatus and instruments included in Class 9.—C. S. Townsend, "Willowdene," The Avenue, Ickenham, Middx.

TIARA. No. 667,851. Class 9. Radio fittings and electrical fittings, all of metal and included in Class 9.—P. Tyralla, Ltd., trading also as "Flit" Slider Fastener Co., 19, Clerkenwell Close, London, E.C.1.

CUTANIT. No. 673,154. SINTRAMET. No. 673,157. Class 9. Electrodes for electric welding, and electrical contacts.—Cutanit, Ltd., 50, Gresham Street, London, E.C.2.

ARGOSY. No. 673,456. Class 9. Radio receiving sets, television apparatus, loudspeakers, amplifying apparatus for electric oscillations; electric indicating, registering, measuring and controlling apparatus, incorporating thermionic valves; parts of all these goods included in Class 9; and electric battery chargers.—British & Overseas Radiovision, Ltd., Enfield Works, 191, Francis Road, Leyton, London, E.10.

DIAMEND. No. 673,509. Class 9. Electrodes designed for depositing hard metal surfaces on other metals.—Rockweld, Ltd., Commerce Way, Croydon, Surrey.

CORONETTE. No. 674,049. Class 9. Aerials.—Belling & Lee, Ltd., Enfield, Middx.

MILLIONITE. No. 680,865. Class 9. Insulated electric cables.—D. A. O'Duffy, 79, Biddulph Mansions, Maida Vale, London, W.9.

CONSULATION. No. 681,343. Class 9. Insulated electric wires, fuse wires and electric cables.—J. Day & Co. (Derby Works), Ltd., Harrow Manorway, Abbey Wood, London, S.E.2.

PERFEX. No. B682,386. Class 9. Electrical switches, electrical switchgear and switchboards (complete) and parts included in Class 9.—V. B. Blundell & F. N. Blundell, trading as Standardise Switchgear Co., 104, Nechells Place, Birmingham, 7.

AVICA. No. 682,852. Class 9. Electrical apparatus and instruments included in Class 9.—Avica Equipment, Ltd., 50, Pall Mall, London, S.W.1.

BUSY BEE (design). No. 672,080. Class 11. Hair-drying appliances, fires, radiators, towel rails, boiling rings, hot plates, immersion heaters, geysers and toasters, all being electrically heated goods; and electric fans, electric lamps, electric torches and electric domestic wash boilers.—Price & Co. (Manchester), Ltd., 50, Spear Street, Oldham Street, Manchester, 1.

FINANCIAL SECTION

STOCKS and SHARES

SATISFACTORY statistics of weekly Revenue returns and of National Savings may be said to play a more important part in the direction of Stock Exchange markets and prices, at any rate for the present, than do political forecasts concerned with the General Election.

Capital in Plenty

It is now more than ever obvious that abundance of money can be relied upon to support any attractive issue, particularly if it is in the shape of duty-free inscribed stock, or of renounceable letters of allotment that call, initially, for no payment of stamp duty. Stock Exchange business remains quiet, nor does any member look for activity to develop, to any noticeable extent, on this side of 23rd February. Prices in the British Government group are moving erratically. British Transport and British Electricity stocks are lower. Industrials mainly hold their previous levels. Another jump in Cable & Wireless ordinary stock contributes an outstanding feature to otherwise somewhat colourless markets.

English Electric Issues

The English Electric Co.'s new 4 per cent debenture stock, the issue of which achieved a notable success at the end of last month, remains fairly steadily around a premium of $2\frac{3}{8}$ points over the offered price of 99. On the assumption that a fair proportion of the £30 million subscribed for this £3 million issue, was looking for no more than a quick turn, the market would not be surprised (other things being equal) to see a further hardening of the price when the "stag" brigade has left the field. The stock will be transferable free of stamp until the final date for renunciotion of allotments on 8th March. New ordinary shares, issued to shareholders at 35s, stand at a premium of 6s 3d. Calls are due of 20s on 15th February and of 15s on 4th April. Until then this issue will also be free of stamp to the buyer.

"Emmies"

The 10s shares of Electric and Musical Industries again deserve special mention as a centre of activity, at rising prices, amidst the generally uninteresting surroundings of the industrial market. Shares have changed hands during the week up to 19s and over, following the B.B.C. announcement that orders have been placed with the company for the two vision transmitters required in connection with the new television stations to be established, in Scotland and in the Bristol Channel area. The yield on the shares at the middle price of 18s 6d is about 5s above the return on Pye 5s deferred at 30s 9d, which pay £4 1s 4d per cent on the money. Cossors, at 8s 3d, and others in this list, are holding their ground.

Changes on the Week

A rise of 6 points lifted Cable & Wireless ordinary stock to $261\frac{1}{2}$ in anticipation of the new scheme which the board is preparing for submission in the near future to proprietors. Tube Investments at 5.9/16 are 3s 9d lower. Amongst minor improvements, there are gains in Crabtree, 33s, Enfield Cable, 28s 9d, General Electric, 73s, Hoover, 35s 3d, Johnson & Phillips, 62s, Lucas, 25s 6d, Mather & Platt, 47s 9d. Westinghouse Brakes are down 1s at 59s 6d.

Miscellaneous Matters

Bylock Electric's full report confirms the profits for 1948/9 at £15,000, as compared with the previous year's loss, and explains that the liquid cash position made it inadvisable to pay a dividend. The 1s shares have changed hands a little below 5s. Among the reactions to last week's "Uniscan" agreement were rises in the quotations for Great Northern Telegraph, now 15, and Elektrolux, 10. Anglo-Argentine Tramways issues came to life last week on a revival of hopes about a take-over: the first debentures rose 4 points to 37.

Stock on Offer

A useful line of Oldham & Son's 1s shares is at present in the market at a price of 5s $4\frac{1}{2}$d. Assuming that last year's dividend rate of 60 per cent (from earnings of over 200 per cent) will be halved in conformity with the subsequent doubling of the ordinary capital, the yield works out at £5 11s 9d per cent. An interim dividend for 1949/50 is due next month. A yield of close on $5\frac{1}{2}$ per cent is indicated also from Taylor Tunnicliff (Electrical Industries) 5s ordinary, on offer at 13s 9d. The annual dividend, which has been 15 per cent for the last two years, is due. Group earnings exceeded 50 per cent last time. In the preference lists, the 5 per cent issues of Thorn Electrical and Hackbridge Cable are offered at 19s and 22s, to yield $5\frac{1}{4}$ and $4\frac{1}{2}$ per cent respectively.

General view of the assembly department at the Newhouse works with the parts store in the background

Making Vacuum Cleaners

Large-Scale Production at a Scottish Factory

ONE of the largest factories in the world devoted exclusively to the manufacture of vacuum cleaners and floor polishers is now in operation on a big scale at Newhouse, Motherwell, Lanarkshire. Production was commenced there about eighteen months ago when Vactric, Ltd., transferred from its nearby factory at Chapelhall, which it had occupied since 1945 following the severe damage by bombing of its works at Cricklewood.

The new factory, which provides employment at the moment for about 800 men and women, has 300,000 sq ft of floor space, the whole of the production area being on one floor. Not all this space is at present occupied in the manufacture of cleaners and polishers and it is proposed before long to utilize the surplus capacity for making certain other electrical appliances.

The spaciousness of the factory has made it possible to arrange an almost ideal production flow, commencing at the incoming goods section on one end and travelling the whole 600 ft length of the factory till it reaches the storage and dispatch departments at the other end. Adjacent to the incoming goods department are bonded stores into which go raw materials which have passed inspection, and castings and pressings both before and after machining. Toolmaking is still carried out at Cricklewood but all the various jigs, tools and fixtures used in the factory are designed in the drawing office and made and maintained in the toolroom at Newhouse.

A foundry has been provided for the production of aluminium alloy castings and to control the quality of the work a modern X-ray unit has been installed. X-ray photographs are taken of a percentage of the castings from each machine, any faults due to porosity being quickly disclosed. Close to the foundry is a section where castings are fettled prior to further processing. A well-equipped plating shop for nickel and chromium finishes includes a good deal of automatic equipment, together with comprehensive polishing plant.

The factory produces all its own press-

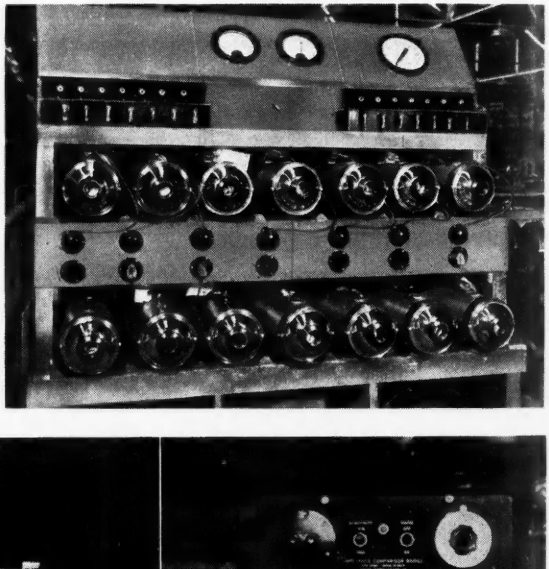
ings. Two 80-ton machines are employed to press out the end domes of the "W.101" cleaner, the latest cylindrical model, smaller type presses dealing with the small parts. Fully automatic machines produce the armature and field laminations.

In addition to a battery of automatic machines for the production of small parts, the machine shop is fully equipped with capstan lathes, drills and grinding and milling machines. The steel cylinder body of the W.101 machine and also the bodies of other models are finished in "Dimenso" paint. To apply this there are spray booths with an automatic oven through which the painted parts pass on a slowly moving belt.

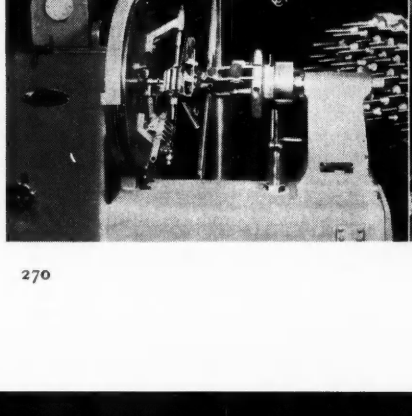
In the armature and field coil section several automatic winding machines of the most modern type have been installed and it is intended that similar machines shall replace semi-automatic machines as further supplies become available. After various assembly and testing processes, the armatures are finally dynamically balanced before and after being impregnated and baked.

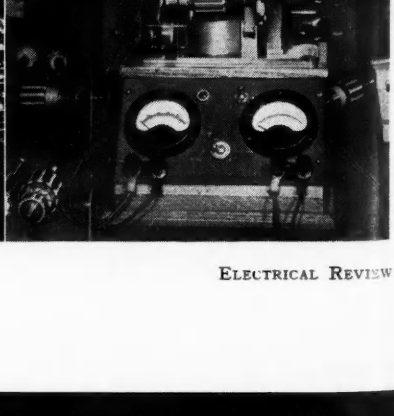
When completed, the armatures and field stacks, machined components and other items required for final assembly go to the finished components stores.

Final on-load soak test running rack equipped with high grade meters and draught indicating instrument



Below (left): Automatic core winding machine for winding turn balanced, 12-slot, 24-coil armatures, in four to five minutes. Below (right): Electronic impedance tester for armature testing, comprising impedance comparison bridge and reversed turns indicator





From the stores the components are issued to the assembly lines, a conveyor belt system being maintained for each individual type of machine. First the motors are assembled with their fans and tested, after which they are built into their cases ready for receiving their various performance tests. Every unit receives a half-hour straight running test followed by a half-hour intermittent running test. The machines are then transferred to the packing line where they are boxed with their components and again passed on to a moving belt into the finished stores. A considerable section is occupied by the export packing department, about one half of the company's total output, including 80 per cent of the floor polishers, going overseas.

Apart from the manufacturing arrangements the factory is noteworthy for the comprehensive facilities available to promote the well-being of the employee. Every one working in the factory is medically examined before joining the company and are encouraged to make use of a well-equipped surgery staffed by a State Registered nurse and visited by the company's doctor at frequent intervals.

A modern kitchen provides many hundreds of meals each day in a dining room which is available for dances, concerts and other social and sporting activities.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1945

5933. Kallmann, H. E.—Screens for cathode-ray tubes. 9th March, 1945. (634702.)

16330. Marconi's Wireless Telegraph Co., Ltd.—Electron-discharge devices. 26th June, 1945. (634703.)

19402. British Thomson-Houston Co., Ltd.—Electronic time delay circuits. 30th July, 1945. (634774.)

27112. Brush Development Co.—Piezoelectric crystal means and method of using same. 16th October, 1945. (634775.)

34124. British Thomson-Houston Co., Ltd.—Non-reflecting optical bodies. 17th December, 1945. (634776.)

34619. Telefonaktiebolaget L. M. Ericsson.—Impulse receiving and registering device for automatic telephone exchanges. 20th December, 1945. (634985.)

1946

923. Barber, N. F., Darbyshire, J., Tucker, M. J., Pierce, F. E. Ursell, F. J., and Wright, C. S.—Apparatus for analyzing recorded wave-forms. 22nd December, 1947. (634914.)

3614. Philco Radio & Television Corporation.—Radio antenna systems. 5th February, 1946. (634845.)

4946. Collins, G., and Wright, Sir C. S.—Electromagnetic filters. 4th December, 1947. (634916.)

7892. Telefonaktiebolaget L. M. Ericsson.—Arrangement in automatic telephone networks for connecting waiting calls to subscriber's lines. 13th March, 1946. (634706.)

19769. Western Electric Co., Inc.—Voltage or current control systems. 2nd July, 1946. (634708.)

24160. General Electric Co., Ltd., Crocker, C. H., and Harris, E. S.—Electric coils. 14th August, 1947. (634846.)

27737. Sherwoods Paints, Ltd., Sunderland, E., and Sarsfield, N. F.—Processes for the impregnation or protection of electrical equipment or components thereof. 15th September, 1947. (634990.)

28498. Percival, W. S., and Holman, H. E.—Variable resistances. 23rd April, 1947 (634713.)

28908. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Overload release clutch mechanisms. 27th September, 1946. (634781.)

30289. British Thomson-Houston Co., Ltd. (General Electric Co.).—Cathode-ray oscilloscopes. 10th October, 1946. (634783.)

31382. British Thomson-Houston Co., Ltd. (General Electric Co.).—Radio-locating equipment. 22nd October, 1946. (634992.)

32260. Compagnie pour la Fabrication des Compteurs et Materiel d'Usines à Gaz.—Thermic interior protection for insulators for electrostatic filters for avoiding condensation. 30th October, 1946. (634714.)

35992. Sadir-Carpentier.—Electrical communication systems utilizing pulse modulation. 5th December, 1946. (634716.)

36641. Marconi's Wireless Telegraph Co., Ltd., and Hassan, H. — Echo sounders and similar distance measuring devices. 27th August, 1947. (634787.)

37265. Standard Telephones & Cables, Ltd., and May, F. W.—Moulding of articles from powder. 12th December, 1947. (634717.)

1947

55. Piccardo, C.—Method of softening boiler feed water and apparatus therefor. 1st January, 1947. (634993.)

759. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Apparatus for examining crystalline structures by means of cathode-rays. 9th January, 1947. (634788.)

2155. Philips Lamps, Ltd.—Luminescent screens. 23rd January, 1947. (634722.)

4278 Electrolux Corporation.—Vacuum cleaners. 14th February, 1947. (Cognate applications 4279, 14th August, 1945, and 4280, 6th December, 1945.) (634995.)

5851. Philips Lamps, Ltd.—Circuits for cathode-ray oscillographs. 28th February, 1947. (634724.)

7232. M-O Valve Co., Ltd., and Kettlewell, E.—Electromagnetic waveguides. 2nd April, 1948. (635000.)

7327. British Thomson-Houston Co., Ltd.—Electric push-button switches. 17th March, 1947. (634790.)

7712. Decca Record Co., Ltd., and O'Brien, W. J.—Radio navigational systems. 19th March, 1948. (635001.)

8235. Naamlooze Vennootschap Philips' Gloeilampenfabrieken. — Magneto-electric machines. 26th March, 1947. (635002.)

8708. Compagnie Générale de Télégraphie sans Fil.—Device for the regulation and centering, under vacuum of a filament for a Wehnelt cathode. 31st March, 1947. (634728.)

9326. Standard Telephones & Cables, Ltd.—High-frequency switching arrangements. 8th April, 1947. (634794.)

10001. Harris, K. E., and Court, G. W. G.—Radar systems. 19th April, 1948. (634729.)

10553. Akt.-Ges. Brown Boveri & Cie.—Gas-blast electric circuit-breaker. 21st April, 1947. (634796.)

10905. Decca Record Co., Ltd., and O'Brien, W. J. —Transmitters for radio navigational aids. 16th April, 1948. (635009.)

14079. General Electric Co., Ltd., Rowlands, R. O., and Westell, E. P. L. — Filters for coupling carrier transmission equipment to power lines. 16th April, 1948. (635014.)

16205. Standard Telephones & Cables, Ltd., Dunn, R. H., Herbert, S., and Fletcher, J. F.—Electric signalling systems. 18th June, 1948 (634804.)

16785. Forges et Ateliers de Constructions Electriques de Jeumont.—Electric motor control system. 25th June, 1947. (635016.)

17886. Sunbeam Corporation.—Electrically heated coffee makers. 7th July, 1947. (634861.)

18078. General Electric Co., Ltd., and Robertshaw, R. G.—Electrical harmonic-generating and frequency-changing apparatus. 29th June, 1948. (635018.)

18314. Sunbeam Corporation.—Electric cooking appliance. 10th July, 1947. (634863.)

18641. Research Corporation.—Electrical precipitators. 14th July, 1947. (634739.)

20439. Metropolitan-Vickers Electrical Co., Ltd., and Carr, L. H. A.—Dynamic braking of induction motors. 2nd July, 1948. (634815.)

20476. Bendix Aviation Corporation.—Dynamo-electric machines employed as generators and starting motors for internal-combustion engines. 29th July, 1947. (634866.)

21924. Standard Telephones & Cables, Ltd.—Bank strips for automatic telephone equipment. 8th August, 1947. (634873.)

22019. Crompton Parkinson, Ltd.—Resilient wheels. 8th August, 1947. (634744.)

23433. Standard Telephones & Cables, Ltd., Moody, N. F., and Howell, W. D.—Smoothing arrangements for d.c. power supply systems. 20th August, 1948. (634819.)

23452. Goodmans Industries, Ltd., and Hosker, G. R.—Loudspeakers. 24th August, 1948. (635024.)

23655. Forges et Ateliers de Constructions Electriques de Jeumont. — Control systems for electric motors. 27th August, 1947. (635026.)

23676. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electron-microscopes. 27th August, 1947. (634820.)

23833. Belling & Co., Ltd., and Eastwood, M.—Electric imitation coal or like fires. 13th July, 1948. (634880.)

24335. De Lavaud, R. S.—Electromagnetic friction clutches. 3rd September, 1947. (634945.)

25694. Jones, A. V., and Vaughan, G. H.—Apparatus for electrocuting cats. 7th July, 1948. (634884.)

27842. General Electric Co., Ltd., and Turrall, J. C. —Electric motor control systems. 5th October, 1948. (634892.)

27916. Power-Gas Corporation, Ltd., and Andreasen, S. V.—Electrolytic cells. 13th October, 1948. (634893.)

29532. Weyandt, C. S.—Electrically operated vibratory apparatus. 5th November, 1947. (635028.)

29616. Metropolitan-Vickers Electrical Co., Ltd., and Higham, E. H.—Direct-coupled amplifying circuit-arrangements. 7th October, 1948. (635029.)

29851. Superheater Co., Ltd. (Huet, A.)—Water tube boilers. 10th November, 1948. (634750.)

30288. Westinghouse Electric International Co.—Electrostatic precipitators. 14th November, 1947. (634826.)

30345. Teleflex Products, Ltd., and Pile, S.—Flexible cables. 14th December, 1948. (634953.)

30834. Hazeltine Corporation.—Resonant electrical arrangement. 20th November, 1947. (634827.)

31008. Watson Electrical Co., Ltd., and Watson, R. C.—Fuses for electric circuits. 20th November, 1948. (634752.)

31160. Blois, W. H., and Marks, A. E.—Electric switch-actuating devices. 17th December, 1948. (634753.)

31477. English Electric Co., Ltd., Brown, H. S., Fenemore, A. S., and Shaw, N. H.—Control systems for electric motors. 18th November, 1948. (634756.)

31598. Siemens Bros. & Co., Ltd., and Stallworthy, F. A.—Telephone systems. 5th November, 1948. (634828.)

32778. English Electric Co., Ltd., Seewer, P. W., Deriaz, P., and Braikevitch, M.—Packings of rotary hydraulic valves. 3rd December, 1948. (634905.)

33456. British Thomson-Houston Co., Ltd.—Welding torches. 18th December, 1947. (634908.)

33544. Metropolitan-Vickers Electrical Co., Ltd., and Smith, R. M. A.—Electrical signalling systems. 2nd December, 1948. (635031.)

33643. Metropolitan-Vickers Electrical Co., Ltd. —Apparatus for dielectric loss treatment. 19th December, 1947. (634758.)

34872. Olsson, G. D., and Bjorkman, N. F.—Selectors for automatic telecommunication equipments. 30th December, 1947. (634911.)

35078. Desmarest, H. G. G.—Electric lamp. 31st December, 1947. (634761.)

1948

27. Runbaken, J. H.—Electric battery testing apparatus. 20th December, 1948. (634912.)

545. Marconi's Wireless Telegraph Co., Ltd., and Rich, C. W.—Variable inductance devices. 3rd September, 1948. (634962.)

1281. General Electric Co., Ltd., and Forbes, W. A. —Automatic telephone systems. 16th November, 1948. (634967.)

2275. Imperial Chemical Industries, Ltd., Hook, W., and Howell, W. N.—Dehydration of fluorine cell electrolytes. 24th January, 1949. (634970.)

2309. Still, R. F.—Electrical heaters. 7th December, 1948. (634763.)

3148. M-O Valve Co., Ltd., and Powell, F. H.—Thermionic valves. 27th January, 1949. (635038.)

4202. Revo Electric Co., Ltd., and Hartill, P.—Lighting or lantern fittings for use in connection with a horizontally disposed linear light source. 12th February, 1949. (634976.)

4884. Thevenot, L. C., Fischer, M. S., and Audubert, R.—Dry plate rectifier. 19th February, 1948. (634768.)

5747. Concordia Electric Safety Lamp Co., Ltd., and Glastonbury, W. H. R.—Lamp cases and other containers. 28th February, 1949. (Cognate application 12997, 12th May, 1948.) (634977.)

6031. Wego Condenser Co., Ltd., Stephan, F. C. —Metal encased electrical components, particularly capacitors. 26th February, 1949. (634769.)

7319. Electric Furnace Co., Ltd., and Collyer, L. C. —Apparatus for operating the covers of electric arc furnaces or like vessels. 10th March, 1948. (635045.)

8667. Carr Fastener Co., Ltd., and Clark, G. W.—Holders for thermionic valves, electric plugs and like electrical devices. 25th January, 1949. (635050.)

28121. Crabtree & Co., Ltd., J. A., Besag, E., Hill, W. E., and Wintle, T. D. G.—Automatic electric circuit-breakers having thermal overload release units. 27th January, 1948. (Divided out of 624581.) (634701.)

28847. Siemens Bros. & Co., Ltd., and Stallworthy, F. A.—Telephone systems. 5th November, 1948. (Divided out of 634828.) (634842.)

1949

129. Collins, G., and Wright, Sir C. S.—Frequency-sensitive electrical devices such as vibration galvanometers. 4th December, 1947. (Divided out of 634919.) (634982.)

E.P.E.A. Kent Section

The annual dinner and dance of the Kent Section of the Electrical Power Engineers' Association will be held on 1st April next at the Royal Star Hotel, Maidstone.

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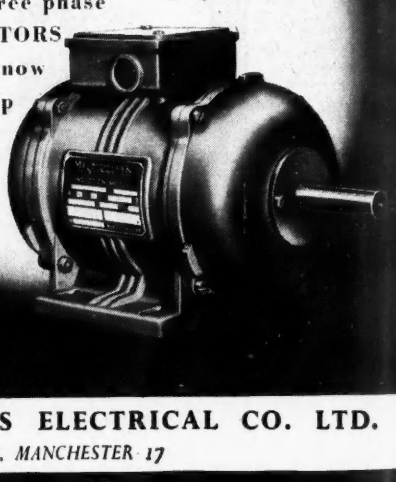

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Welding-Load Metering

Ascertaining Peak Currents

THE metering of welding loads was discussed at a recent meeting of the Measurements Section of the Institution of Electrical Engineers.

In his introductory remarks, Mr. G. F. Shotter explained the difficulties introduced by the shortness of the welding time. For instance, in welding aluminium tanks from 800 to 1,000 A was taken for three to six cycles; in welding iron boxes made of 22 s.w.g. metal from 200 to 250 A (r.m.s.) was taken for a half-cycle; details of a third example were: single-phase 415 V input, 390 kVA welder, 4,990 kWh/annum, 300/5 c.t. ratio of demand indicator, 208 A m.d. recorded, 760 A peak and three cycles welding time.

Investigations made on behalf of the E.R.A. by Messrs. W. J. Darby and G. F. Shotter indicated that the only true method of comparison was by the maximum (r.m.s.) amperage and that no conventional instrument was capable of measuring that. (See E.R.A. report K/T.123.)

Current Transformer Construction

The nomenclature used for describing various time factors in resistance welding was important. To obtain sensible demand indicator readings it was necessary to install more than one instrument and a current transformer having a ratio as low as a third or a quarter of the peak r.m.s. current taken by the welder. Such transformers should have Stalloy rather than Mumetal cores, owing to the latter's inaccuracies at four times full rating.

Tariffs could be based on peak currents, but the latter could be measured only by Duddell and cathode-ray oscillographs. So Mr. Shotter designed an instrument that could be installed in a welding set, or used with a conventional instrument when the load was mixed, which would accurately record the peak current; and could be calibrated on a steady load.

The usual meter would satisfactorily measure the kWh taken by a welder, though it was advisable to use more than one meter and a current transformer rated below the peak of the welder. The meters should have the minimum of anti-creep compensation, to avoid reversal.

In the discussion which followed, one speaker demonstrated an electronic meter which read actual peak (not r.m.s.) currents, no matter how short or infrequent the pulses were. The voltage peak produced by the current across a resistor was rectified and charged a capacitor to a voltage which was then measured by an infinite impedance detector. As the needle of the meter remained fixed at the peak value until the capacitor was discharged, the device had been named a "Stickatron."

Many speakers discussed tariffs, for which it seemed there was no simple solution. Examples were given of the nuisance which such loads were to other consumers. The supply engineer might have to provide larger cables and a lower impedance circuit, the cost of which might not be related in any simple way to the peak demand, but would depend on other factors as well.

One speaker suggested that the important figure to be measured was the volts-drop during the welding process rather than the peak current itself.

The differences between arc and resistance welding were stressed, and a plea put forward for the consumer. Tariffs were often based on the rating shown on the welder, which would be much higher than the real load. The lack of uniform standards was also criticized.

One speaker suggested that there was no point in using a kWh-meter, except when the duty cycle was high; he even proposed that there should be no extra charge at all for short loads (lasting less than one cycle) if they caused no inconvenience.

Lighting Flicker

On the subject of flicker produced in lighting circuits by welding loads, Mr. Shotter stated that welds lasting only half a cycle could produce noticeable flicker, but that the trouble was less on l.v. circuits.

The use of large capacitors to improve performance in welding circuits was also mentioned, but possible effects of this in inflating meter readings were pointed out. One speaker remarked that the only complete solution to the problem was not to use the mains at all, but to employ motor-generator sets with large flywheels.

In his reply, Mr. Shotter emphasized that normal meters *could* be used to give reasonably accurate results under certain conditions. He added that in some cases the use of parallel capacitors produced considerable wave-form distortion. He was not concerned with tariffs but only with what actually happened in welding circuits.

NEXT WEEK'S EVENTS

Monday, 13th February

BIRMINGHAM.—Imperial Hotel, 6 p.m. I.E.E. South Midland Supply and Utilization Group. "Overhead Line Regulations," by H. W. Grimmitt.

LEEDS.—Lighting Service Bureau, 6 p.m. I.E.S. Leeds Centre. "Street Lighting—its Background," by E. J. Stewart.

LONDON.—Savoy Place, W.C.2., 5.30 p.m. Institution of Electrical Engineers. Informal meeting. Discussion on "Interference Suppression," opened by E. M. Lee.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "The Design, Specification and Performance of High-Voltage Surge Diverters," by H. F. Jones and C. J. O. Garrard.

SWANSEA.—The Guildhall, 6.30 p.m. I.E.E. Western Centre. Faraday Lecture on "Radar," by Dr. R. A. Smith.

Tuesday, 14th February

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "The Automatic Control of Lead-Acid Battery Charging Equipment," by R. A. Harvey.

BIRMINGHAM.—Midlands Electricity Board Service Centre, Paradise Street, 7 p.m. E.P.E.A. Midland Technical Group. Two sound films: "Radar Goes to Sea" and "Planned Electrification."

BIRMINGHAM.—I.E.E. South Midland Students' Section, 7 p.m. Visit to Telephone House to see the Birmingham Central Trunk and Toll Exchanges.

GLASGOW.—At the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, 7 p.m. I.E.E. Scottish Centre. "Generation and Flow of Harmonics in Transmission Systems," by Dr. S. Whitehead and Dr. W. G. Radley.

LONDON.—Lighting Service Bureau, 2, Savoy Hill, W.C.2, 6 p.m. Illuminating Engineering Society. "The Dimming of Fluorescent Lamps and its Application to the Theatre," by Dr. J. W. Strange.

WIMBLEDON.—Compton Hall, Compton Road, 8.15 p.m. A.S.E.E. South-West London Branch. "Practical Problems with M.I. Cables," by G. E. D. Redman.

Wednesday, 15th February

BOURNEMOUTH.—Grand Hotel, 6.30 p.m. I.E.E. Southern Centre. "The Recurrent Surge Oscillograph and its Application to the Study of Surge Phenomena in Transformers," by E. L. White and W. Nethercot.

COVENTRY.—Technical College, The Butts, 7 p.m. A.S.E.E. Coventry Branch. "The Use of Magnets in Industry To-day," by J. F. Cordwell.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "Generation and Flow of Harmonics in Transmission Systems," by Dr. S. Whitehead and Dr. W. G. Radley.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Radio Section. "Ground-Wave Propagation over an Inhomogeneous Smooth Earth—Experimental Evidence and Practical Implications," by G. Millington and G. A. Isted.

MAIDSTONE.—New Inn, Sanding Road, 7.30 p.m. I.E.E. District Meeting. "An Historical Survey of the Development of Electric Cables," by J. T. Hazel.

MANCHESTER.—Engineers' Club, Albert Square, 7.30 p.m. A.S.E.E. Manchester Branch. "Simple Vector Diagrams as Applied to Electrical Calculations," by J. W. Fall.

SHEFFIELD.—Grand Hotel, 6.15 p.m. I.E.E. Sheffield Sub-Centre. "Some Projects favourable to Direct-Current Transmission and the Role of the British Electrical Industry in Relation thereto," by F. J. Erroll and the Earl of Verulam.

SWANSEA.—The Y.M.C.A., 6 p.m. I.E.S. Swansea Group. "Lighting for Sports and Games," by D. E. Beard.

Thursday, 16th February

BRADFORD.—Y.E.B. Offices, 45-53, Sunbridge Road, 7.30 p.m. I.E.S. Bradford Group. "The Development of Plastics for Lighting," by P. H. Collins.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Steel-Cored Aluminium Conductors for Rural Distribution," by H. Montgomery.

KETTERING.—George Hotel, 7.30 p.m. I.E.E. East Midland Centre. "The Testing, Reconditioning and Servicing of Domestic Appliances," by H. Hobbins.

LONDON.—Caxton Hall, S.W.1, 2.30 p.m. Diesel Engine Users' Association. Discussion on "Operating Problems."

Friday, 17th February

ABERDEEN.—Robert Gordon's Technical College, 7.30 p.m. I.E.E. North-East Scotland Sub-Centre. "Service Apparatus," by L. B. Perkins.

BRISTOL.—Grand Spa Hotel, 6.30 for 7 p.m. I.E.E. Western Centre. Annual dinner and dance and visit of President.

LONDON.—Connaught Rooms, W.C.2, 12.15 for 1 p.m. Electrical Trades' Commercial Travellers' Association. Annual luncheon.

STAFFORD.—King Edward Grammar School, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Factors Influencing the Design of High-Voltage Air-Blast Circuit Breakers," by C. H. Flurscheim and E. L. L'Estrange.

Saturday, 18th February.

BRADFORD.—Technical School, 2.30 p.m. I.E.E. North Midland Students' Section. Short talk and visit to inspect electron-microscope.

E.C.A. Conference

We have already mentioned that this year's conference of the Electrical Contractors' Association is to be held at Hastings in May. The actual dates are 24th to 26th May, the week preceding Whitsun.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Belgium.—BRUSSELS.—22nd February. Belgian State Railways. Various electric cables. (C.R.E. (I.B.) 42036/50. Ten/952.)*

Burnley.—24th February. Corporation. Electrical installation in the extension to the Towneley Technical High School for Boys. (See this issue.)

Cuckfield.—27th February. R.D.C. Installation of electricity in Council houses. (See this issue.)

Felling.—18th February. U.D.C. Electric wiring, fittings, equipment, materials and components, in seventy houses in course of erection near Wardley Hall, Heworth. D. W. Green, housing architect, Council Buildings.

Horwich.—24th February. U.D.C.. Supply of electric lamps (tungsten and sodium), for one year. J. Seddon, clerk, Council Offices.

Irlam.—4th March. U.D.C. Supply of electric lamps for one year. Surveyor, Council Offices.

King's Lynn.—15th February. Borough Council. Supply of electric lamps for one year. H. G. Ridler, borough surveyor, 27, Queen Street.

London.—WESTMINSTER.—16th February. City Council. Supply of electric lamps, cable, etc., for three, six or twelve months. P. Morris, Town Clerk. Charing Cross Road, W.C.2.

POPLAR.—16th February. Borough Council. Supply of electric lamps for one year. Town Clerk, Bow Road, E.3.

Manchester.—24th March. Education Committee. Electrical engineering work at the Municipal College of Technology. (See this issue.)

Middlesbrough.—Education Committee. Installation of electric lighting and power at the Education Offices. T. R Middleton, education architect.

Orpington.—25th February. U.D.C. Internal wiring of 340 pre-1939 houses on 14 sites. Particulars from the housing manager, The Priory, Church Hill.

Preston.—20th February. Corporation. Electricity installations in sixty-seven houses, Brookfield estate. (See 3rd February issue.)

South Africa.—CAPE TOWN.—22nd February. Electricity Department. Supply of electric cables. (C.R.E. (I.B.) 42030/50. Ten/948.)*

Staffordshire.—28th February. County Council. Electrical services at the Stafford Children's Homes, Rotherwood, Rowley Park. T. H. Evans, clerk, County Buildings, Stafford.

* **Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1. (Victoria 9040.)**

ORDERS PLACED

Middlesbrough.—Town Council. Complete renewal of the electric wiring at the Central Baths (£3,175).—Anderson & Son, Ltd.

Northumberland.—County Council. Alterations to electrical installations at No. 43, The Side, Newcastle (£128); and stage lighting and equipment at Bellingham County Mixed School (£227).—Falconar, Cross & Co. Electrical installation at Ballarat Cottage Child Welfare Centre, Blyth (£276).—Devereux Moodie & Co. Electric services at "Greenholme," Haltwhistle (£161).—J. Willoughby.

Sheffield.—Corporation. Installation of electric lighting in connection with the rehabilitation of the Manor County School (£2,150).—No. 3 Sub-Area, Yorkshire Electricity Board.

Stockton-on-Tees.—Town Council. Electrical installations in 50 houses (£1,122).—J. Emmerson, Stockton.

Tynemouth.—Corporation. Electrical installation in 36 houses (£873).—Tanjon (Newcastle), Ltd., Newcastle-on-Tyne.

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Atherton.—Extensions to Formby Hall for U.D.C.; J. C. Prestwich & Sons, architects, Leigh.

Cardiff.—Storage buildings, Colchester Avenue (£50,000), for South Wales Cinema Renters' Society; H. Bugden & Co., architects, 96, St. Mary's Street.

Chadderton.—Houses (263), Lower Bare Trees site; F. W. Pexton, U.D.C. surveyor.

Chester.—Houses (50), Blacon site; city surveyor.

Works extensions; Arthol Manufacturing Co., Ltd., Sealand Road.

Christchurch.—Extensions to Odstock Hospital; Adams, Holden & Pearson, architects, University of London, W.C.1.

Cleckheaton.—County primary school, Hightown (£74,000); West Riding county architect, Wakefield.

Colchester.—Houses (81), Shrub End estate; borough surveyor.

Coseley.—Houses (40), Bamford estate, for U.D.C.; K. E. Millard & Co., Ltd., Oldbury, Worcs.

Cudworth.—Factory; Albert Martin & Co., Ltd., Barnsley Road.

Daventry.—Houses (20) for T.C.; Bosworth & Wakeford, Ltd., New Street.

Durham.—New St. Mary's College for Durham University; J. R. Rutherford & Sons, builders, Jesmond, Newcastle-on-Tyne.

Exeter.—Block of shops and offices, High Street, for Pearl Assurance Co. (£100,000); A. E. Eveleigh, builder, Richmond Road.

Friern Barnet.—Flats (58), The Hollies, for U.D.C.; K. Smith, architect, 10, Bayley Street, W.C.1.

Garston.—Heavy test laboratory at Building Research Station; Haymills (Contractors), Ltd., Hanger Green, Ealing, W.5.

Great Yarmouth.—Houses (78), Magdalen College estate; borough engineer, 15, Regent Street.

Harlow.—Three blocks of flats for Harlow Development Corporation; Gilbert Ash, Ltd., builders, 2, Stanhope Gate, W.1.

Hove.—Flats (36), Sunninghill; T. R. Humble, borough surveyor, Town Hall.

Hull.—Office block, Jameson Street; C. Cowles Voysey, architect, 2, Bunkers Hill, London, N.W.11.

Block of shops and offices, Ferensway, for T.C.; Robinson & Sawdon, Ltd., builders, 95, Alexandra Road.

Ilford.—Shops and flats, New North Road; C. F. Day, Ltd., 705, High Road, N.12.

Houses (36), Lancelot Way; New Ideal Homesteads, Ltd., Mead House, South Street, Epsom.

Ilkeston.—Dwellings (87), Kirk Hallam estate, for T.C.; A. Mason, Ltd., contractors, Kirkland Avenue, Mansfield.

Ipswich.—Junior school, Chantry estate, for T.C.; Johns & Slater, architects, 8, Lower Brook Street.

Irthlingborough.—Houses (58); U.D.C. surveyor.

Keighley.—Junior school at Guard House; United Kingdom Construction Co., Ltd., Ashton-under-Lyne.

Kirkby-in-Ashfield.—Houses (60), Skegby Road and Cherry Avenue; U.D.C. surveyor.

Leatherhead.—Works, Randall's Park estate; Ronson Products, Ltd., 352, Strand, London, W.C.2.

Leeds.—Houses (256), Beckett estate; R. A. H. Livett, city architect.

School, Barwick Road; W. Tocher, architect, 8, Blenheim Terrace, Leeds.

Leicester.—Junior school, New Parks; J. Chapman & Sons, builders, Knighton Junction Works.

Liverpool.—Flats (45), Gore Street area; city architect.

London. — BERMONDSEY. — Dwellings (110), Ainsty Street; borough housing architect.

STOKE NEWINGTON.—Block of 30 flats, Shakespeare Walk; Howes & Jackman, architects, 1, Verulam Buildings, W.C.1.

SYDENHAM.—Two-storey office block, Sydenham Road; Baxter, Payne & Lepper, East Street, Bromley.

STEPNEY.—Dwellings (145), Bancroft Road scheme, 2nd section; A. A. Hudson, borough engineer, London Fruit Exchange, Duval Street, E.1.

Long Eaton.—Houses (36), Wilsthorpe and Oakleys Roads; F. Turner, U.D.C. surveyor, Town Hall.

Maidstone.—Omnibus works extensions, Postley Road; Maidstone & District Motor Services, Ltd., Knightrider Street.

Manchester.—Home for aged at Broadway, Moston (£30,000); L. A. Howitt, city architect.

March (Cambs).—New Roman Catholic church (£11,000); C. W. Glover & Partners, 54, Victoria Street, S.W.

Middlesbrough.—Houses (72), Beechwood; borough engineer.

Morecambe.—Flats (20) and houses (20), Blackberry Hall estate; borough surveyor.

North Shields.—X-ray department at Preston Hospital for Newcastle Regional Hospital Board; Hastie D. Burton, Ltd., builders, King Street.

Nottingham.—Assembly halls for schools at Birchover Road (£27,040); R. M. Finch, city surveyor.

Houses (68), Strelley estate; city housing architect.

Nuneaton.—Flats (58), Church St.; Morris & Jacombs, Ltd., Birmingham.

Orrell.—Houses (38), Moor Road site; F. Butterfield, U.D.C. surveyor, Council Offices, Orrell Post, near Wigan.

Radcliffe.—Houses (62), Outwood estate; borough surveyor.

Redbourn.—Houses (56), for St. Albans R.D.C.; surveyor, 41, Upper Lattimore Road, St. Albans.

Sheffield.—Light engineering works, Ecclesfield Road; Cintride, Ltd., 112, St. Phillips Road.

Sittingbourne.—Primary school; R. Messenger, architect, High Street, Herne Bay.

Southall.—Flats (32), Longford estate and the Common; borough surveyor.

Southampton.—Departmental stores for Mayes & Son, Ltd., 173, High Street; Gutteridge & Gutteridge, architects, 45, Westwood Road.

Southend-on-Sea.—Houses (59); borough surveyor, Municipal Buildings.

South Shields.—Blocks of flats for 196 families for the T.C.; John Reid, borough engineer.

Surrey.—County primary school, West Ewell (£45,550); County architect, County Hall, Kingston-on-Thames.

Tamworth.—Houses (22) for R.D.C. at Dotshill estate; A. Purshouse & Sons, Rookery Street, Wednesfield, Staffs.

I.E.S. Summer Meeting

THE second post-war summer meeting of the Illuminating Engineering Society is to be held at Buxton from 16th to 19th May. In addition to social events and excursions, there are to be four technical papers and two addresses, one of which will be by Mr. Ivar Folcker, chairman of the National Illumination Committee of Sweden, who will talk about lighting developments in his country during the last ten years. Non-members are invited to participate, forms of application being obtainable from the Illuminating Engineering Society, 32, Victoria Street, London, S.W.1.